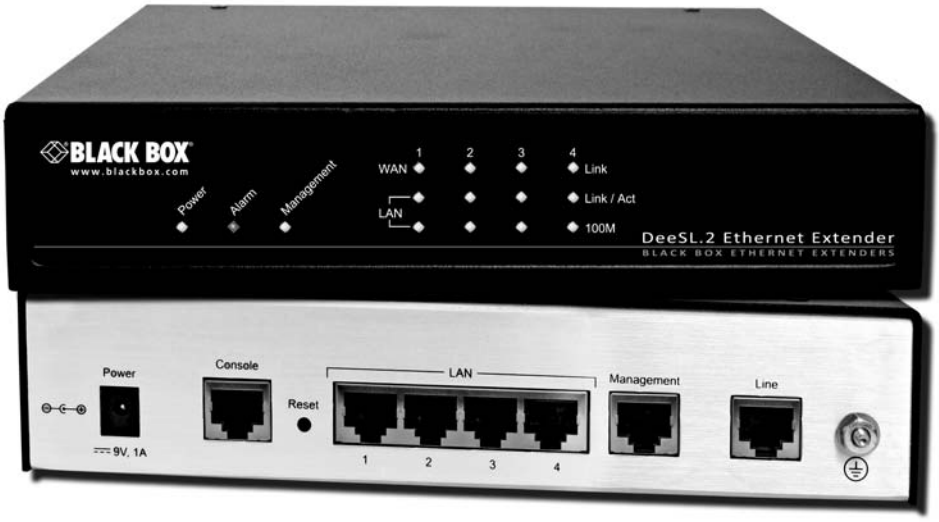
BLACK BOX
NETWORK SERVICES

LB522A-KIT
LB524A-KIT
LB528A-KIT

DeeSL.2 Ethernet Extender

Extend corporate LAN communications at higher speeds or at a longer distance.



Customer Support Information

Order toll-free in the U.S.: Call 877-877-BBOX (outside U.S. call 724-746-5500)
FREE technical support 24 hours a day, 7 days a week: Call 724-746-5500 or fax 724-746-0746 • Mailing address: Black Box Corporation, 1000 Park Drive, Lawrence, PA 15055-1018 • Web site: www.blackbox.com • E-mail: info@blackbox.com

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RADIO FREQUENCY INTERFERENCE STATEMENTS

FEDERAL COMMUNICATIONS COMMISSION AND INDUSTRY CANADA RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate radio-frequency energy, and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

INSTRUCCIONES DE SEGURIDAD

(Normas Oficiales Mexicanas Electrical Safety Statement)

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.

2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.

3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.

4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14.El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15.En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16.El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17.Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18.Servicio por personal calificado deberá ser provisto cuando:

A. El cable de poder o el contacto ha sido dañado; u

B. Objectos han caído o líquido ha sido derramado dentro del aparato; o

C. El aparato ha sido expuesto a la lluvia; o

D. El aparato parece no operar normalmente o muestra un cambio en su desempeño; o

E. El aparato ha sido tirado o su cubierta ha sido dañada.

SAFETY WHEN WORKING WITH ELECTRICITY

• This device contains no user serviceable parts. This device can only be repaired by qualified service personnel.

• Do not open the device when the power cord is connected. For systems without a power switch and without an external power adapter, line voltages are present within the device when the power cord is connected.

• For devices with an external power adapter, the power adapter shall be a listed Limited Power Source. The mains outlet that is utilized to power the device shall be within 10 feet (3 meters) of the device, shall be easily accessible, and protected by a circuit breaker in compliance with local regulatory requirements.

• For AC powered devices, ensure that the power cable used meets all applicable standards for the country in which it is to be installed.

• For AC powered devices which have 3 conductor power plugs (L1, L2 & GND or Hot, Neutral & Safety/Protective Ground), the wall outlet (or socket) must have an earth ground.

• For DC powered devices, ensure that the interconnecting cables are rated for proper voltage, current, anticipated temperature, flammability, and mechanical serviceability.

• WAN, LAN & PSTN ports (connections) may have hazardous voltages present regardless of whether the device is powered ON or OFF. PSTN relates to interfaces such as telephone lines, FXS, FXO, DSL, xDSL, T1, E1, ISDN, Voice, etc. These are known as “hazardous network voltages” and to avoid electric shock use caution when working near these ports. When disconnecting cables for these ports, detach the far end connection first.

• Do not work on the device or connect or disconnect cables during periods of lightning activity.

In accordance with the requirements of council directive 2002/96/EC on Waste of Electrical and Electronic Equipment (WEEE), ensure that at end-of-life you separate this product from other waste and scrap and deliver to the WEEE collection system in your country for recycling.

This device contains no user serviceable parts. This device can only be repaired by qualified service personnel.

This device is NOT intended nor approved for connection to the PSTN. It is intended only for connection to customer premise equipment.

Electrostatic Discharge (ESD) can damage equipment and impair electrical circuitry. It occurs when electronic printed circuit cards are improperly handled and can result in complete or intermittent failures. Do the following to prevent ESD:

• Always follow ESD prevention procedures when removing and replacing cards.

• Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the clip to an unpainted surface of the chassis frame to safely channel unwanted ESD voltages to ground.

• To properly guard against ESD damage and shocks, the wrist strap and cord must operate effectively. If no wrist strap is available, ground yourself by touching the metal part of the chassis.

1. GENERAL INFORMATION

Thank you for your purchase of this Black Box® product. This product has been thoroughly inspected and tested and is warranted for one year for parts and labor. If any questions or problems arise during installation or use of this product, contact Black Box Technical Support at 724-746-5500 or info@blackbox.com.

1.1 FEATURES

- High speed extension with speeds up to 22.8 Mbps
- up to 8-wire (4 pair) Line connection via built-in RJ-45 ports
- 4 auto 10/100Base-Tx, full or half-duplex Ethernet ports for direct connection of four Ethernet devices
- Extends Ethernet up to 1.8 miles (2.9 km) using 24 AWG/0.5mm wire (192 kbps speed)
- CE marked

1.2 DESCRIPTION

The Black Box® LB52xA-KIT simplifies and provides cost-effective network extension by utilizing pre-existing twisted pair infrastructure, which enables service providers to offer broadband or data backhaul services to businesses, governments and various institutions over existing last-mile, copper infrastructure. Today, more than ever, operators are finding the business case for leveraging their existing copper networks to be highly attractive from an ROI and initial investment perspective over fiber roll-outs.

Black Box's LB52xA-KIT Ethernet Extender incorporates multi-pair bonding to offer an unmatched rate, reach and reliable Ethernet connectivity, providing symmetrical 22.8 Mbps of bandwidth over 4-pair (8-wire) at distances up to 1.8 miles (2.9 km). The LB52xA-KIT comes standard with a 4-port fast Ethernet switch with full QoS and CoS features. VLAN (802.1q) capabilities include 4 levels of priorities, traffic flow control and rate control. These traffic management and QoS features enable service providers to provision for differentiated services and/or SLAs.

The following base models are available:

- LB522A-KIT: Ethernet Extender (2-wire), 5.7 Mbps
- LB524A-KIT: Ethernet Extender (4-wire), 11.4 Mbps
- LB528A-KIT: Ethernet Extender (8-wire), 22.8 Mbps

Refer to Appendix A for a complete feature description of the LB52xA-KIT.

Figure 1. LB52xA-KIT

1.3 LB52XA-KIT FRONT PANEL

1.3.1 LED Descriptions

The front panel LEDs display the status of the power, system, Ethernet ports, and Line port. Figure 2. shows the front panel LED indicators and Table 1 provides a description of the LED indicators' behavior.

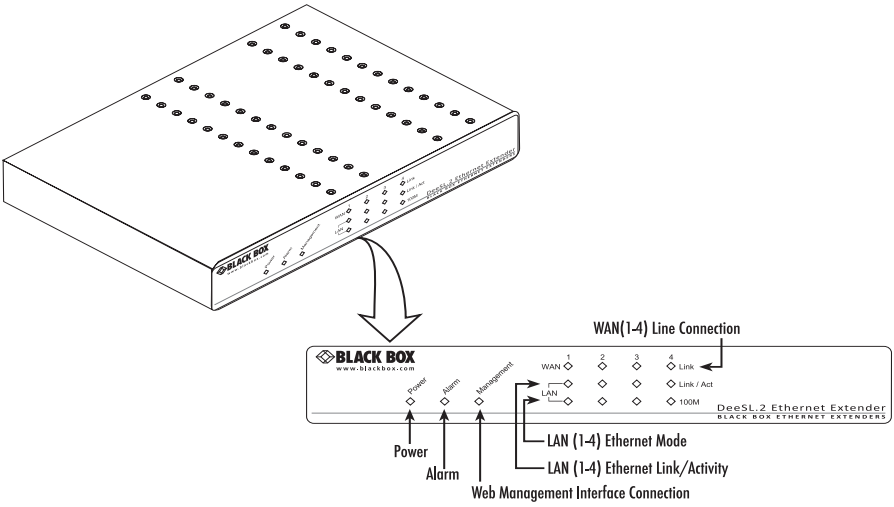

Figure 2. LB52xA-KIT front panel LEDs

Table 1: Front panel LEDs

LED	Condition	Description
Power	**On**	**Power is applied**
Alarm	**On** **Blink**	**LINE connection dropped** **LINE self-test**
Management	**On**	**Management port is connected**
WAN (1-4) LINK	**On** **Blink**	**LINE is connected** **LINE handshake/transmited/received data**
LAN (1-4) LINK/ACT	**On** **Blink**	**Ethernet is connected** **Ethernet link transmitted/received data**
LAN (1-4) 100M	**On** **Off**	**LAN port is on 100M mode** **LAN port is on 10M mode**

1.4 LB52XA-KIT REAR PANEL

1.4.1 Port Descriptions

The Black Box LB52xA-KIT rear panel ports are shown in the figure below and described in Table 2.

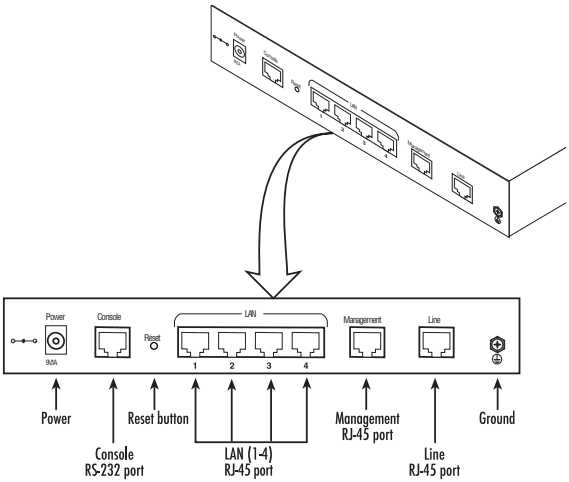

Figure 3. LB52xA-KIT rear panel

Table 2: Port descriptions

Port	Description
Power	**Power adaptor inlet: Input voltage 9VDC**
Console (RS-232 control port)	**Used for service and maintenance, the Console port, an RS-232 RJ-45 connector with EIA-561 pinout, connects the router to a serial terminal such as a PC or ASCII terminal (also called a dumb terminal). Asynchronous default data rate 9600 bps, hardware DSR and DTR signals for external modems are wired directly together internally.**
Reset	**Reset button for rebooting or loading factory default settings**
LAN (LAN Ethernet Ports 1-4)	**10/100Base-Tx full-/half-duplex, RJ-45, auto detection and fallback, connects the unit to an Ethernet LAN.**
Management	**RJ-45 for management port**
Line	**Interface for WAN port (RJ-45)**

NOTE: For port pinout information, see Appendix B. on page 109.

1.5 RESET BUTTON

- To restart the unit with the current startup configuration—Press the *Reset* button for less than 1 second and release. The LB52xA-KIT will restart with the current startup configuration.
- To restart the unit with factory default configuration—Press the *Reset* button for 5 seconds until the Power LED starts blinking. The unit will restart with factory default configuration.
- To restart the unit in bootloader mode (to be used only by trained Black Box technicians)—Start with the unit powered off. Press and hold the *Reset* button while applying power to the unit. Release the *Reset* button when the *Power* LED starts blinking so the unit will enter bootloader mode.

1.6 GROUND TERMINAL

The marked lug or terminal should be connected to the building protective earth bus. The function of protective earth does not serve the purpose of providing protection against electrical shock, but instead enhances surge suppression on the lines for installations where suitable bonding facilities exist. The connector type is M3 machine screw.

2. APPLICATIONS OVERVIEW

The Black Box LB52xA-KIT simplifies and provides cost effective network extension by utilizing pre-existing twisted pair infrastructure. This enables service providers to offer broadband or data backhaul services to businesses, governments and various institutions over existing last-mile, copper infrastructure. Today, more than ever, operators are finding the business case for leveraging their existing copper networks to be highly attractive from an ROI and initial investment perspective over fiber roll-outs.

2.1 TYPICAL APPLICATION

The Black Box Extenders are the perfect fit for simple, cost-effective high speed Ethernet Extension. They allow customers to take advantage of the existing copper infrastructure to connect remote LANs across distances and at speeds previously unthought-of. The auto-rate feature ensures the highest speed is achieved on each connection, and the plug and play operation ensures they are up and running in seconds. Add in the 4 x auto-sensing full/half duplex 10/100Base-TX Ethernet ports with the integrated crossover switch to make setup even easier. The value of these Ethernet Extenders can't be beat!

- **Auto-Rate Feature**—The advanced auto-rate algorithm automatically determines the best possible rate for each connection and sets up each extender without any need for user interface.
- **Plug and Play**—Just unpack the extenders, plug them into each end of the extension, power them up, and they are up and running. It doesn't get any easier!
- **High Speed/Long Reach**—These Ethernet Extenders provide the best combination of speed and distance seen anywhere in the industry!

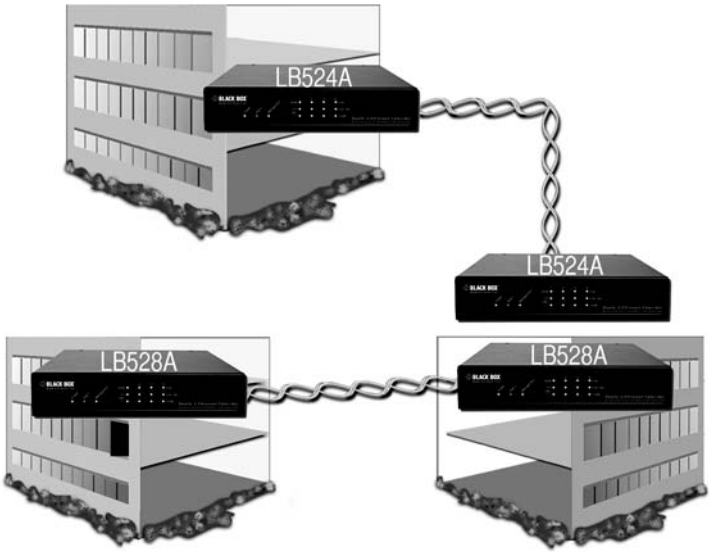

Figure 4. LB52xA-KIT application

2.2 DISTANCE CHARTS

2.2.1 Distance Chart LB52xA-KIT Series - Auto Mode (TCPAM-32/16)

Table 3: Distance Chart LB52xA-KIT

Line Rate				Distance					
Line Speed	522A 2-Wire	524A 4-Wire	528A 8-Wire	26 AWG/ 0.4mm		24 AWG/ 0.5mm		22 AWG/ 0.65mm	
N=	kbps	kbps	kbps	kft	km	kft	km	kft	km
3	192	384	768	17.0	5.2	21.5	6.6	27.5	8.4
4	256	512	1024	17.0	5.2	20.5	6.2	27.0	8.2
8	512	1024	2048	14.5	4.4	17.5	5.3	23.5	7.2
12	768	1536	3072	13.5	4.1	16.0	4.9	21.5	6.6
16	1024	2048	4096	12.5	3.8	15.0	4.6	20.0	6.1
20	1280	2560	5120	12.0	3.7	14.5	4.4	19.0	5.8
24	1536	3072	6144	11.5	3.5	14.0	4.3	18.5	5.6
32	2048	4096	8192	11.0	3.4	13.5	4.1	17.5	5.3
36	2304	4608	9216	11.0	3.4	13.0	4.0	17.0	5.2
60	3840	7680	15360	9.0	2.7	11.0	3.4	14.5	4.4
72	4608	9216	18432	8.5	2.6	10.0	3.0	13.5	4.1
89	5696	11392	22784	7.5	2.3	9.0	2.7	12.0	3.7

2.2.2 Distance Chart LB52xA-KIT Series - Optimal Mode (TCPAM - 128)

Table 4: Distance Chart LB52xA-KIT Series - Optimal Mode

Line Rate				Distance					
Line Speed	522A 2-Wire	524A 4-Wire	528A 8-Wire	26 AWG/ 0.4mm		24 AWG/ 0.5mm		22 AWG/ 0.65mm	
N=	kbps	kbps	kbps	kft	km	kft	km	kft	km
7	448	896	1792	20.0	6.1	24.0	7.3	31.0	9.4
8	512	1024	2048	19.0	5.8	23.0	7.0	30.0	9.1
10	640	1280	2560	18.0	5.5	20.5	6.2	28.0	8.5
11	704	1408	2816	17.0	5.2	19.0	5.8	26.5	8.1
16	1024	2048	4096	16.0	4.9	18.0	5.5	24.5	7.5
20	1280	2560	5120	15.0	4.6	17.0	5.2	23.0	7.0

Line Rate				Distance					
Line Speed	522A 2-Wire	524A 4-Wire	528A 8-Wire	26 AWG/ 0.4mm		24 AWG/ 0.5mm		22 AWG/ 0.65mm	
N=	kbps	kbps	kbps	kft	km	kft	km	kft	km
22	1408	2816	5632	14.0	4.3	15.5	4.7	21.0	6.4
27	1728	3456	6912	13.0	4.0	14.5	4.4	20.0	6.1
34	2176	4352	8704	12.0	3.7	14.5	4.4	18.5	5.6
39	2496	4995	9987	11.0	3.4	13.0	4.0	17.0	5.2
44	2816	5362	11264	10.0	3.0	12.0	3.7	15.5	4.7
53	3392	6784	13568	9.0	2.7	10.5	3.2	13.5	4.1
73	4681	9344	18688	8.0	2.4	9.5	2.9	12.5	3.8
89	5696	11392	22784	7.0	2.1	8.5	2.6	10.5	3.2
110	7040	14080	28160	6.0	1.8	7.0	2.1	9.0	2.7
125	8000	16000	32000	5.0	1.5	6.0	1.8	7.5	2.3
152	9728	19456	38912	4.0	1.2	4.5	1.4	6.0	1.8
164	10496	20992	41984	3.0	0.9	3.5	1.1	4.5	1.4
198	12792	25584	51168	2.0	0.6	2.5	0.8	3.0	0.9

2.2.3 Distance Chart LB52xA-KIT Series - TCPAM - 128

Table 5: Distance Chart LB52xA-KIT Series - TCPAM-128

Line Rate				Distance					
Line Speed	522A 2-Wire	524A 4-Wire	528A 8-Wire	26 AWG/ 0.4mm		24 AWG/ 0.5mm		22 AWG/ 0.65mm	
N=	kbps	kbps	kbps	kft	km	kft	km	kft	km
5	320	640	1280	22.0	6.7	26.5	8.1	34	10.4
6	384	768	1536	21.0	6.4	25.5	7.8	32.5	9.9
8	512	1024	2048	20.0	6.1	24.0	7.3	31.0	9.4
9	576	1152	2304	19.0	5.8	23.0	7.0	29.5	9.0
9	576	1152	2304	18.0	5.5	21.5	6.6	27.5	8.4
12	768	1536	3072	17.0	5.2	20.5	6.2	26.5	8.1
16	1024	2048	4096	16.0	4.9	19.5	5.9	24.5	7.5
20	1280	2560	5120	15.0	4.6	18.0	5.5	23.0	7.0
22	1408	2816	5632	14.0	4.3	16.5	5.0	21.5	6.6
27	1728	3456	6912	13.0	4.0	15.7	4.8	20.0	6.1
34	2176	4352	8704	12.0	3.7	14.5	4.4	18.5	5.6

Line Rate				Distance					
Line Speed	522A 2-Wire	524A 4-Wire	528A 8-Wire	26 AWG/ 0.4mm		24 AWG/ 0.5mm		22 AWG/ 0.65mm	
N=	kbps	kbps	kbps	kft	km	kft	km	kft	km
39	2496	4992	9984	11.0	3.4	13.0	4.0	17.0	5.2
45	2880	5760	11520	10.0	6.0	12.0	3.7	15.5	4.7
53	3392	6784	13568	9.0	2.7	10.5	3.2	13.5	4.1
74	4736	9472	18944	8.0	2.4	9.5	2.9	12.5	3.8
90	5760	11520	23040	7.0	2.1	8.5	2..6	10.5	3.2
112	7168	14336	28672	6.0	1.8	7.0	2.1	9.0	2.7
126	8064	16128	32256	5.0	1.5	6.0	1.8	7.5	2.3
152	9728	19456	38912	4.0	1.2	4.5	1.4	6.0	1.8
167	10688	21376	42752	3.0	0.9	3.5	1.1	4.5	1.4
198	12672	25344	50688	2.0	0.6	2.5	0.8	3.0	0.9
220	14072	28144	56288	1.0	0.3	1.0	0.3	1.5	0.5
239	15288	30476	61152	0.5	0.2	0.5	0.2	1.0	0.3

3. HARDWARE INSTALLATION

This chapter contains information for planning the installation of the LB52xA-KIT with the following installation procedures:

- “Unpacking the LB52xA-KIT” on page 20 lists the contents of the shipping box
- “Connecting cables” on page 21 describes how to install the port cables
- “Grounding the LB52xA-KIT and connecting power” on page 21 describes how to ground and connect the power source

3.1 PLANNING THE INSTALLATION

Before beginning the actual installation, we strongly recommend that you gather all the information you will need to install and set up the device.

- Create a network diagram
- Gather IP related information
- Install the hardware and software needed to configure the LB52xA-KIT
- Verify power source reliability

When you finish preparing for your installation, go to section “Installing the LB52xA-KIT” on page 20 to install the device.

3.1.1 Network Diagram

Draw a network overview diagram that displays all neighboring IP nodes, connected elements and telephony components. Figure 5. shows possible network connections to the LB52xA-KIT.

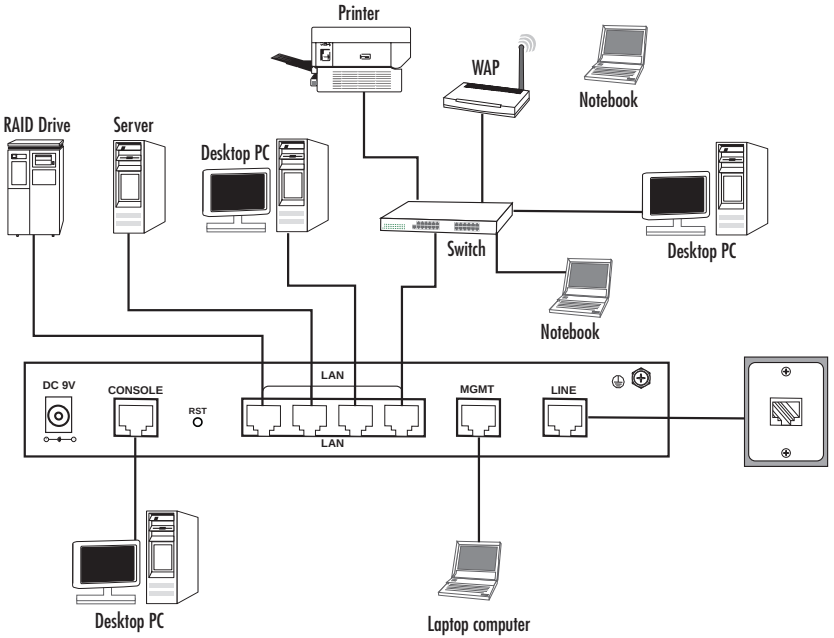

Figure 5. LB52xA-KIT connection diagram

3.1.2 IP Related Information

Before you can set up the basic IP connectivity for your LB52xA-KIT series you should have the following information:

- IP addresses used for Ethernet LAN and WAN ports
- Subnet mask used for Ethernet LAN and WAN ports

You will need a PC (or equivalent) with a VT-100 emulation program (e.g. HyperTerminal) to configure the software on your LB52xA-KIT.

3.1.3 AC Power Mains

If you suspect that your AC power is not reliable, for example if room lights flicker often or there is machinery with large motors nearby, have a qualified professional test the power. Install a power conditioner if necessary. Refer to “Grounding the LB52xA-KIT and connecting power” on page 21.

The mains outlet that is utilized to power the equipment must be within 1 foot (3 meters) of the device and shall be easily accessible.

NOTE: When setting up your LB52xA-KIT, you must consider cable-length limitations and potential electromagnetic interference (EMI) as defined by the applicable local and international regulations. Ensure that your site is properly prepared before beginning installation.

3.1.4 Location and mounting requirements

The LB52xA-KIT is intended to be placed on a desktop or a similar sturdy, flat surface that offers easy access to the cables. Additionally, you should consider the need to access the unit for future upgrades and maintenance.

This completes the planning phase for installation. The next section begins the installation procedures.

3.1.5 Installing the LB52xA-KIT

Unpacking the LB52xA-KIT

Inspect the shipping carton for external damage. Note any damage before removing the container contents. Report any equipment damage to the shipping carrier immediately for claim purposes. Save all packing material in case you need to return an item to the factory for servicing.

The LB52xA-KIT comes with the following items:

- LB52xA-KIT
- An RJ-45-to-RJ-45 cable for use with the console and Ethernet ports
- A DB-9-to-RJ-45 (EIA-561) adapter for connecting a PC’s serial port to the LB52xA-KIT console port

NOTE: Power cables are shipped separately from the LB52xA-KIT

3.1.6 Connecting cables

The Interconnecting cables must be acceptable for external use and must be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

1. Connect the Ethernet cable to the Management port. LB52xA-KIT supports audi-MDIX switching so you may use a crossover or straight-through cable.
2. Connect one end of a phone cable to the LINE port and the other end of the cable to a wall jack.

Do not work on the system or connect or disconnect cables during periods of lightning activity.

3.1.7 Grounding the LB52xA-KIT and connecting power

When connecting to the power source, it is important to establish a good grounding connection first, and then the power connection. Do the following:

1. Assemble a ground wire using #10 AWG wire with green-colored insulation and two ring terminals. Make the wire long enough to reach one of the following **earth ground sources**:
   - The building ground rod (generally located at the site's main service entrance)
   - A sprinkler system pipe
   - A cold-water pipe
   - Building structural steel

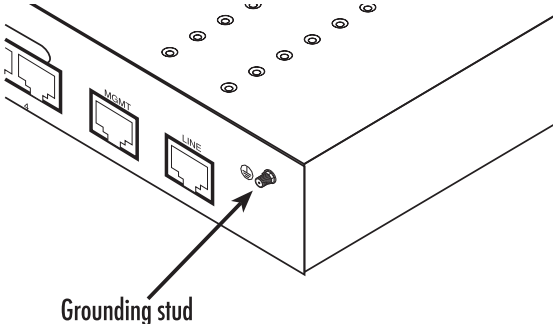

Figure 6. Grounding stud

2. Install the grounding wire between the grounding stud (see Figure 6.) and the grounding source.

3. Connect the power adapter to the DC 9V port on the LB52xA-KIT, and then connect to the power source.

WARNING

Mains Voltage: Do not open the case the when the power cord is attached. Line voltages are present within the power supply when the power cords are connected. The mains outlet that is utilized to power the device shall be within 10 feet (3 meters) of the device, shall be easily accessible, and protected by a circuit breaker.

WARNING

The LB52xA-KIT is not shipped with power cables. For AC powered units, ensure that the power cable used meets all applicable standards for the country in which it is to be installed, and that it is connected to a wall outlet that has earth ground.

IMPORTANT

The power supply automatically adjusts to accept an input voltage from 100 to 240 VAC(50/60 Hz).

3.2 CONFIGURING THE LB52XA-KIT

There are three different ways you can configure the LB52xA-KIT—the serial console, Telnet or a web browser.

3.2.1 Web configuration requirements

Make sure that the PC you use for configuration has an Ethernet adapter and TCP/IP installed.

The LB52xA-KIT provides a browser interface that allows you to configure and manage the Ethernet Extender. After you set up the IP address for the LB52xA-KIT, you can access the Ethernet Extender's Web interface applications directly in your browser by entering the IP address. You can then use your Web browser to manage and configure the unit from a PC.

NOTE: For detailed information on configuring the LB52xA-KIT through the Web interface, see Section 4., "Web Configuration" on page 24 .

3.3 CONSOLE CONFIGURATION REQUIREMENTS

To configure the LB52xA-KIT through the serial console, you can directly connect a terminal or a PC equipped with a terminal-emulation program (such as Hyper Terminal) to the Ethernet Extender's console port.

Use the supplied serial cable (RJ-45 to DB9F) to connect the LB52xA-KIT to a PC. After marking the connection, configure the terminal-emulation program to use the following parameters:

- 9600 bps
- 8 data bits
- no parity
- 1 stop bit

NOTE: For detailed information on configuring the LB52xA-KIT through the serial console, see Section 5., "Console and Telnet Configuration" on page 67.

3.3.1 Telnet configuration requirements

Make sure that the PC you use for configuration has an Ethernet adapter and TCP/IP installed. The LB52xA-KIT supports Telnet for remote configuration. The command is "**telnet 192.168.1.1**". When prompted for the username and password for remote

login, use *admin* for both fields. All display screens are the same as the serial console configuration.

The default IP address is **192.168.1.1**, but you may change the IP address for your application.

NOTE: For detailed information on configuring the LB52xA-KIT through Telnet, see Section 5., "Console and Telnet Configuration" on page 67.

4. WEB CONFIGURATION

The LB52xA-KIT provides a browser interface that allows you to configure and manage the Ethernet Extender. Make sure that the PC you use for configuration has an Ethernet adapter and TCP/IP installed. After you set up the IP address for the LB52xA-KIT, you can access the Ethernet Extender's Web interface applications directly in your browser by entering the IP address. You can then use your Web browser to manage and configure the unit from a PC.

4.1 SETTING UP THE WMI

This section introduces the configuration and functions of the Web Management Interface (WMI). The WMI is an HTML-based management interface that allows you to easily set-up and manage the LB52xA-KIT.

The LB52xA-KIT offers all monitoring and management features that allow users to manage this LB52xA-KIT form anywhere on the network through a standard browser such as Internet Explorer.

4.1.1 TCP/IP setup

When DHCP is enabled, the LB52xA-KIT acts as a DHCP server in your network. The LB52xA-KIT will automatically assign IP address for the management port connection.

To set up TCP/IP on a Windows PC:

1. Click the **Start** button. Select the **Control Panel**.
2. Double-click on the **Network** icon.
3. In the Configuration window, select the TCP/IP protocol line that has been associated with your network card and then click the **Property icon**.

4. Click on the **IP address** tab and select **Obtain IP address automatically**. Click **OK**.

4.1.2 System Login

You may use a web browser such as Internet Explorer on your PC to connect the LB52xA-KIT. Type *"http:///"* and the IP address, such as "*http://192.168.1.1*".

The default IP address and sub net-mask of the Management port of the LB52xA-KIT are **192.168.1.1** and **255.255.255.0**. If DHCP is disabled, your PC can set the same net-mask, such as *192.168.1.x* where *x* is a number from 2 to 254.

Type the default username **root** and default password **root** and then click **OK**. For system security, you should change the user name and password after initial configuration.

Figure 7. System login screen

4.2 BASIC CONFIGURATION OPTIONS

This section contains information for setting up the Operation mode and Management port IP, DHCP server, and LAN via the WMI. Figure 8. shows a flowchart demonstrating basic setup via the WMI for the LB52xA-KIT.

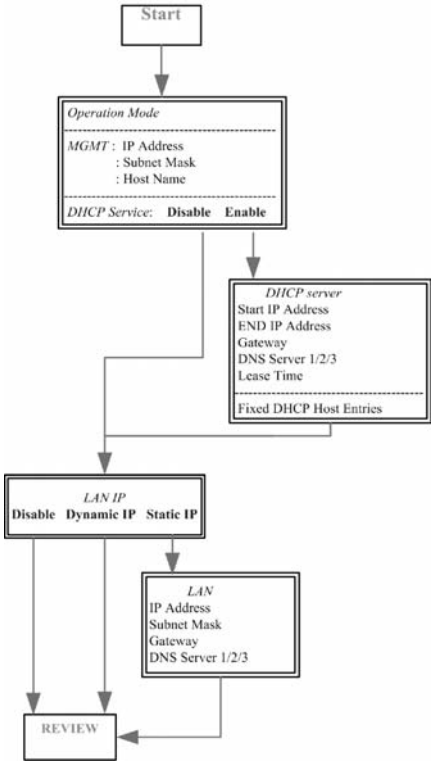

Figure 8. Basic setup flowchart

4.2.1 Operation mode and Management port

To configure the operation mode and Management port in the WMI:

1. From the main menu, click **Basic** to display the basic installation page.

Figure 9. Operation mode and Management port setup page

2. For **Operation mode**, select the radio button for **CPE** (Customer Premises Equipment) or **CO** (Central Office). When using a “LAN to LAN” connection, one side must be set as CO and the other side must be set as CPE.

3. Enter information for the **Management port**. The LB52xA-KIT requires an IP address to be managed over the network. The factory default IP address is **192.168.1.1**. The subnet mask specifies the network number portion of an IP address. The factory default subnet mask is **255.255.255.0**. You can configure another IP address and a different subnet mask for management purposes.

   - **IP:** 192.168.1.1
   - **Subnet Mask:** 255.255.255.0
   - **Host Name:** SOHO

NOTE: Some ISP providers require the Host Name as identification. You may check with your ISP to see if your Internet service has been configured with a host name. In most cases, you can ignore this field.

4. Select an option for **Trigger DHCP Service**. If you don't need the DHCP service, select **Disable**.

5. Click **Next** to commit your changes and continue to the **DHCP Server** page (refer to the next section).

4.2.2 DHCP server

Dynamic Host Configuration Protocol (DHCP) is a communication protocol that allows network administrators to manage and automate the assignment of Internet Protocol (IP) addresses in an organization's network. Each machine that can connect to the Internet requires a unique IP address. When an organization sets up the users with a connection to the Internet, an IP address must be assigned to each machine.

Without DHCP, the IP address must be entered manually at each computer. If computers move to another location in another part of the network, a new IP address must be entered. DHCP lets a network administrator supervise and distribute IP addresses from a central point and automatically sends a new IP address when a computer is plugged into a different place in the network. The embedded DHCP server assigns network configuration information to 253 users (max) accessing the Internet in the same time. For example, if the LAN IP address is 192.168.0.1, the IP range of the LAN is 192.168.0.2 to 192.168.0.254.

To set up the DHCP Server for the LB52xA-KIT:

1. Click on **Basic** from the main menu, set up the **Operation Mode** and **Management port**, then click **Next** to reach the **DHCP Server** page.

2. The DHCP server assigns the IP from the Start IP Address to the End IP Address. The legal IP address range is from 0 to 255, but 0 is reserved as the network name and 255 is reserved for broadcast. This implies that the legal IP address range is from 1 to 254. That means you cannot assign an IP greater than 254 or less than 1.

3. A **Lease Time** of 72 hours indicates that the DHCP server will reassign IP information every 72 hours, which is the default value for the LB52xA-KIT. You can set up the **Lease Time** for a range from 1 to 720 hours according to your application.

4. If you assign a fixed IP address to a device while using DHCP, you must enter the device's MAC address in the **Table of Fixed DHCP Host Entries**.

5. Click **Next** to commit your changes and continue to the **LAN** page (refer to the next section).

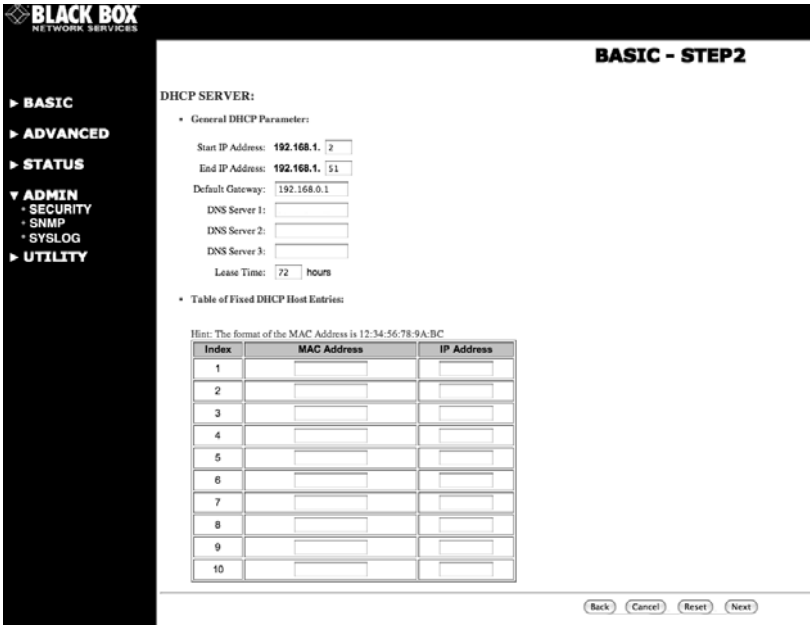

Figure 10. Basic DHCP setup

4.2.3 LAN

To configure LAN settings through the WMI:

1. Click on **Basic** from the main menu. Set up the **Operation Mode** and **Management port**, then click **Next**. Set up the **DHCP Server**, then click **Next** to reach the **LAN** page.

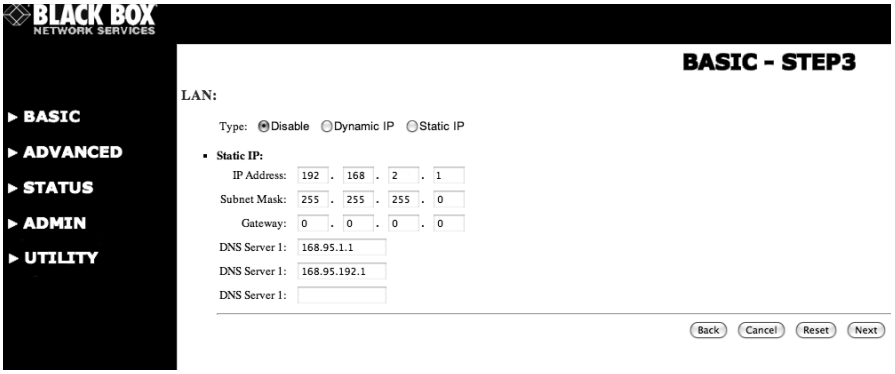

Figure 11. LAN setup page

2. Choose an option for the **LAN Type**. If you select **Disable** or **Dynamic IP**, click **Next** at the bottom of the screen to save your changes. If you select **Static IP**, you can enter information for IP, Subnet Mask, Gateway and DNS Server's IP.

3. If you select **Static IP** as the **LAN Type**, enter details in the **Static IP** section. The default values for **Static IP** are:

   - **IP Address:** 192.168.2.1
   - **Subnet Mask:** 255.255.255.0
   - **Gateway:** 0.0.0.0
   - **DNS Server 1:** 168.95.1.1
   - **DNS Server 2:** 168.95.192.1

4. Click **Next** to commit your changes and continue to the **Review** page (refer to the next section).

4.2.4 Review and save basic setup changes

1. Once you have entered information on the pages for **Operation Mode** and **Management Port**, **DHCP Server**, and **LAN**, the **Basic Setup Review** page will display to confirm your changes.

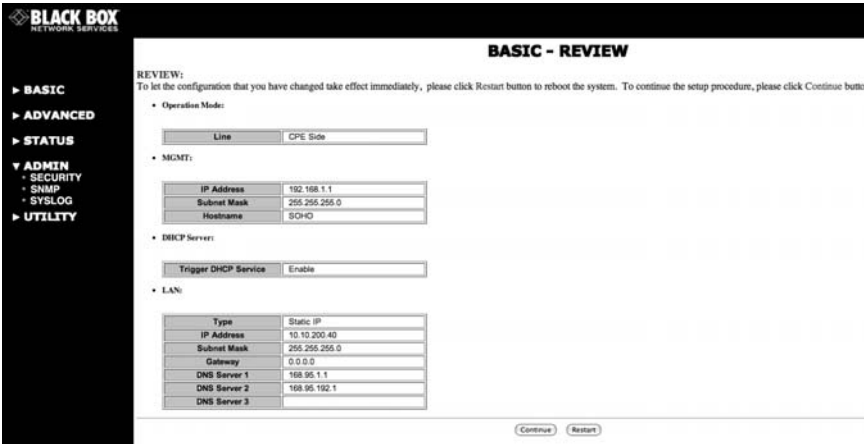

Figure 12. Review and save basic setup changes

2. Look over the **Review** page to confirm the desired settings.
3. Click **Restart** to reboot the LB52xA-KIT with the new settings.
4. Click **Continue** to configure other options.

4.3 ADVANCED CONFIGURATION OPTIONS

This section contains information for setting up advanced options for the LB52xA-KIT via the WMI. Advanced setup contains LB52xA-KIT Line, VLAN, QoS and Rate Control parameters.

NOTE: The advanced functions are only intended for administrators. The incorrect advanced settings will affect the performance of the LB52xA-KIT or cause system errors and disconnection.

4.3.1 LINE

Click on **LINE** under **Advanced** on the main menu to reach the LINE advanced configuration page. You can setup the Link (number of wires), Annex Type, TCPAM Type,

Main Rate, SNR Margin, and Line Probe settings for LINE parameters (refer to the following sections to explore each of the configuration options).

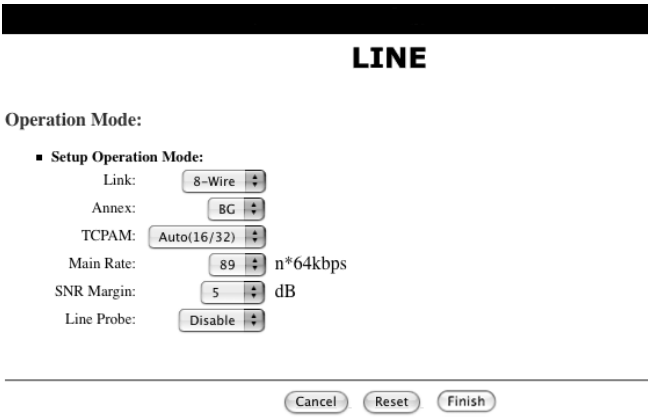

Figure 13. LINE page

Link

Select the line type for your model from the **Link** drop-down list. Line type means how many wires you want to use on the line side. For example, you can select 2-wire, 4-wire or 8-wire line type for the 8-wire model.

Table 6: Line Type Chart

		Line Type		
		2-Wire	**4-Wire**	**8-Wire**
Model Type	**522A 2-Wire model**	●		
	524A 4-Wire model	●	●	
	528A 8-Wire model	●	●	●

Annex Type

Select the appropriate **Annex** type from the drop-down list. **Annex AF** describes the transmission and performance requirements for North America. **Annex BG** describes performance and transmission requirements for Europe.

TCPAM Type

TCPAM (Trellis Coded Pulse Amplitude Modulation) is the standard used for line coding. Select the **TCPAM** type from the drop-down list. **Auto** is the default option for **TCPAM**. You can also manually set the TCPAM type.

Main Rate

Select the line rate for your model from the **Main Rate** drop-down list. The main rate is the multiple of 64kbps, 128kbps, or 256kbps- depending on your model type. Use the table below to determine the best main rate for your model.

Table 7: Main Rate Chart

Model Type	Multiple	TCPAM - 16 = 3-60	TCPAM - 32 = 12-89	TCPAM - 128 = 2-239
LB522A-KIT 2-wire	64	192-3840	768-5696	128-15296
LB524A-KIT 4-wire	128	384-7680	1536-11392	256-30592
LB528A-KIT 8-wire	256	768-15360	3072-22784	512-61184

SNR Margin

Select the desired **SNR Margin** value from the drop-down list. SNR margin is an index of line connection quality. You can see the actual SNR margin in STATUS. You will experience better line connection quality for larger SNR margin values.

For example, if you set the SNR margin to 5, the LINE connection will drop and reconnect when the SNR margin is lower than 5. On the other hand, the device will reduce the line rate and reconnect for better line connection quality. You may select the SNR margin from the range -10 to 21.

Line Probe

For adaptive mode applications, set the **Line Probe** to **Enable**. The LB52xA-KIT will adapt the data rate according to the line status. The screen will prompt the parameters that will be written in NVRAM. Check the parameters before writing in NVRAM.

For all other applications, set the **Line Probe** to **Disable**.

Click **Restart** to reboot the LB52xA-KIT with the new settings. Click **Continue** to configure other options.

4.3.2 VLAN

Click on **VLAN** under **Advanced** on the main menu to reach the VLAN advanced configuration page.

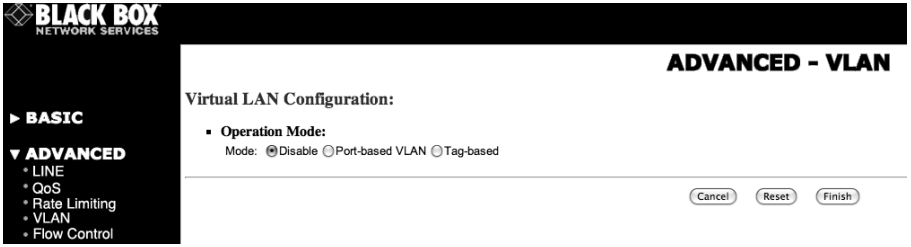

Figure 14. VLAN page

VLAN (Virtual Local Area Network) allows a physical network to be partitioned into multiple logical networks. Devices on a logical network belong to one group. A device can belong to more than one group. With VLAN, a device cannot directly talk to or hear from devices that are not in the same group.

With MTU (Multi-Tenant Unit) applications, VLAN is vital in providing isolation and security among the subscribers. When properly configured, VLAN prevents one subscriber from accessing the network resources of another on the same LAN.

VLAN also increases network performance by limiting broadcasts to a smaller and more manageable logical broadcast domain. In traditional switched environments, all broadcast packets go to each individual port. With VLAN, all broadcasts are confined to a specific broadcast domain.

You can select from two types of VLAN: 802.1Q Tag-Based VLAN and Port-Based VLAN. The VLAN Setup screen changes depending on whether you choose 802.1Q Tag-Based VLAN type or Port Based VLAN type. The **IEEE 802.1Q** defines the operation of VLAN bridges that permit the definition, operation, and administration of VLAN topologies within a bridged LAN infrastructure.

Figure 15. on the following page shows a diagram of possible VLAN connections.

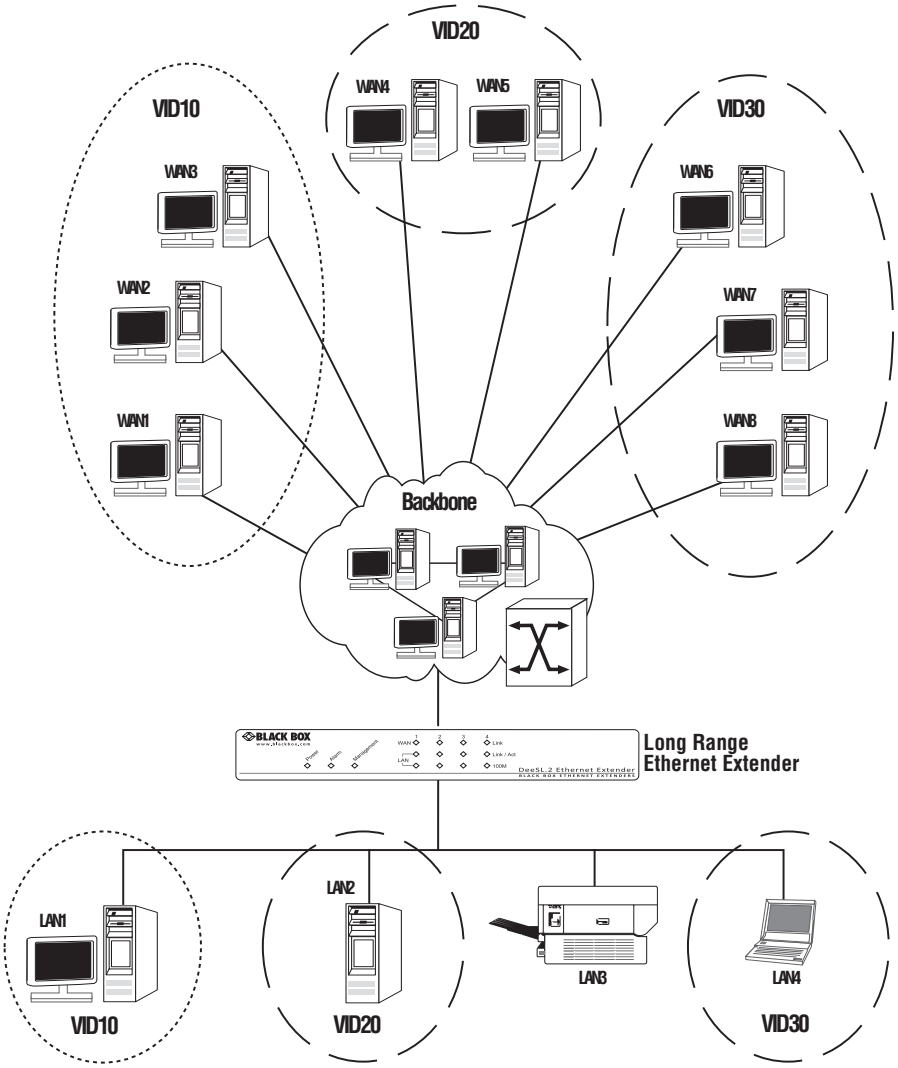

Figure 15. VLAN Diagram

802.1Q Tag-Based VLAN

Click on **VLAN** under **Advanced** on the main menu to reach the VLAN advanced configuration page. Then, select the radio button for **802.1Q Tag-Based VLAN** to display the configuration options.

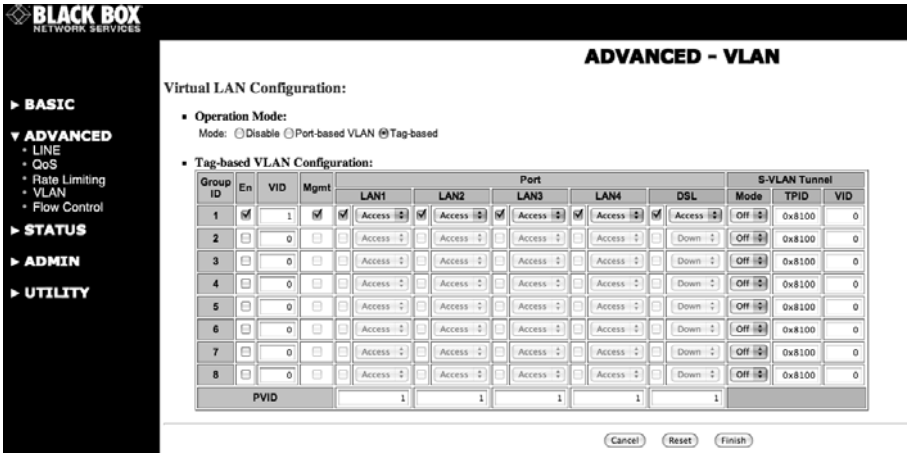

Figure 16. 802.1Q Tag-Based VLAN page

- **VID (Virtual LAN ID):** A number to identify the VLAN segment. Select from 1 to 4094.
- **PVID (Port VID):** An untagged member of the default VLAN. Select from 1 to 4094.
- **Link Type:** Select from **Access** or **Trunk**. **Access** means the port can receive or send *untagged* packets. **Trunk** means that the port can receive or send *tagged* packets.

In 802.1q, the VLAN information is written into the Ethernet packet itself. Each packet carries a VLAN ID (Virtual LAN ID) called a *tag*. This tag allows VLANs to be configured across multiple switches.

NOTE: VLAN tags may be stripped by the hardware or the software.

When using 802.1q, four bytes are added to the Ethernet frame, and 12 bits are used for the VLAN ID. Theoretically, there can be up to 4096 VLANs per network.

An Ethernet packet that contains a VLAN ID is called a *tagged packet*. An Ethernet packet without a VLAN ID is called an *untagged packet*. Typically, all packets leave untagged, unless tagged by the adapter prior to arriving at the switch port.

Egress and Ingress Rules. Egress rules determine which frames can be transmitted out of a port, based on the Egress List of the associated VLAN. Each VLAN has an Egress List that specifies the ports out of which frames can be forwarded, and specifies whether the frames will be transmitted as tagged or untagged frames.

Ingress rules are a means of filtering out undesired traffic on a port. When Ingress Filtering is enabled, a port determines if a frame can be processed based on whether the port is on the Egress List of the VLAN associated with the frame.

When an untagged packet arrives at the switch port, the switch will write a VLAN ID into the header of the frame according to the PVID (port VLAN) definition. Typically, most switches today have all ports set to a default PVID of 1. When a tagged frame arrives at a switch port, the tag is respected.

A VID defines the member of a port group. A packet can only travel inside a member port when the member port is part of a VID port group. Different VID groups are not visible to one another.

Tag-Based VLAN Overview. The figure below shows the breakdown of the VLAN tag field.

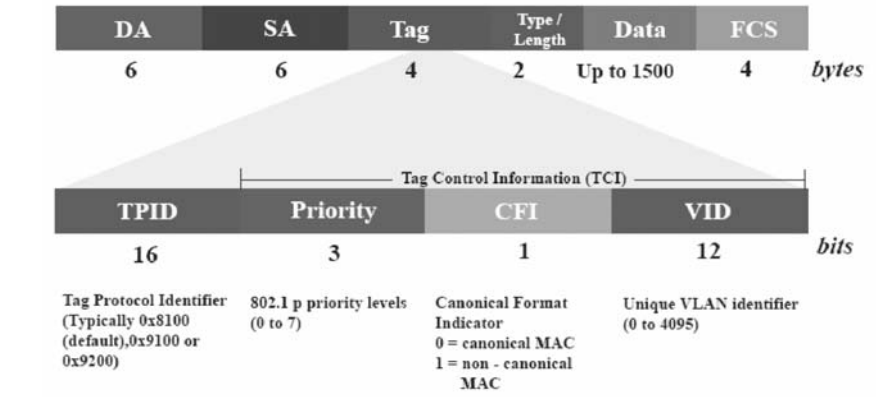

Figure 17. VLAN tag field

The **Tag Control Information (TCI)** section of a VLAN tag includes information on the user **Priority** level, the **Canonical Format Indicator (CFI)** and **VLAN ID (VID)**.

- **Tag Protocol Identifier (TPID)** is a defined value of 8100 in hex. When a frame has the EtherType equal to 8100, this frame carries the tag IEEE 802.1Q / 802.1P.
- **Priority** defines the priority level for different classes of traffic. There are 8 possible priority levels, with 0 being the lowest priority level and 7 being the highest level. IEEE 802.1P defines the operation for these 3 user priority bits.
- **Canonical Format Indicator (CFI)** is always set to zero for Ethernet switches. CFI is used for compatibility reasons between an Ethernet-type network and Token Ring-type network. If a frame received at an Ethernet port has a CFI set to 1, then that frame should not be forwarded as it is to an untagged port.
- **VLAN ID (VID)** is the unique identification number of the VLAN, which is used by the standard 802.1Q. It has 12 bits and allows the identification of 4096 (212) VLANs. Of the 4096 possible VIDs, a VID of 0 is used to identify priority frames and the value 4095 (FFF) is reserved, so the maximum possible VLAN configurations are 4,094.

The LB52xA-KIT initially configures one VLAN by default, VID=1. A port such as LAN1–4, line or sniffing can have only one **Port VID (PVID)**, but can have as many VID groups as the LB52xA-KIT has memory in its VLAN table to store them.

Ports in the same VLAN group share the same frame broadcast domain thus increase network performance through reduced broadcast traffic. You can modify VLAN groups at any time by adding, moving or changing ports without any re-cabling.

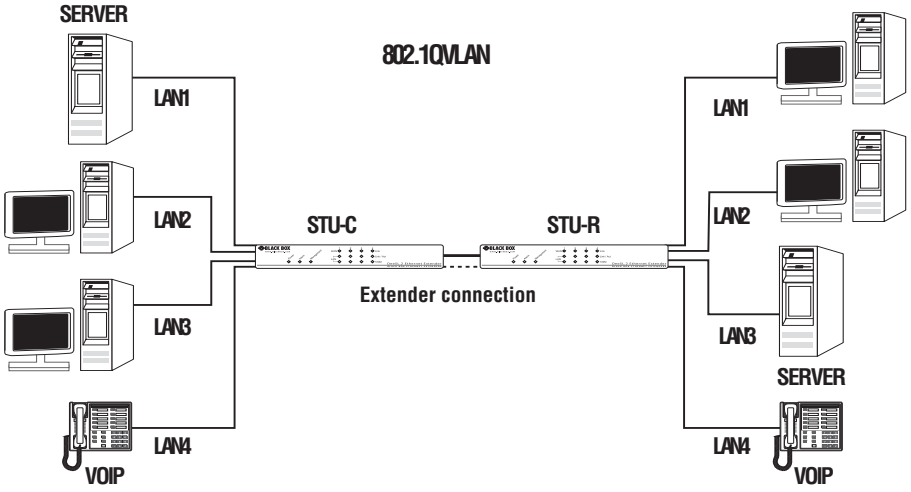

Figure 18. 802.1Q VLAN diagram

Configuring 802.1Q VLAN Tagging. Before enabling VLANs for the LB52xA-KIT, you must first assign each port to the VLAN group(s) in which it will participate. By default all ports are assigned to VLAN1 as untagged ports. Add a port as a tagged port if you want it to carry traffic for one or more VLANs, and any intermediate network devices or the host at the other end of the connection supports VLANs. Then, assign ports on the other VLAN-aware network devices along the path that will carry this traffic to the same VLAN(s), either manually or dynamically using **Generic VLAN Routing Protocol (GVRP)**. However, if you want a port on this LB52xA-KIT to participate in one or more VLANs, but none of the intermediate network devices nor the host at the other end of the connection supports VLANs, then you should add this port to the VLAN as an untagged port.

NOTE: VLAN-tagged frames can pass through VLAN-aware or VLAN-unaware network inter-connection devices, but the VLAN tags should be stripped off before passing it on to any end-node host that does not support VLAN tagging.

- **VLAN Classification** - When the LB52xA-KIT receives a frame, it classifies the frame in one of two ways. If the frame is untagged, the LB52xA-KIT assigns the frame to an associated VLAN (based on the default VLAN ID of the receiving port). But if the frame is tagged, the LB52xA-KIT uses the tagged VLAN ID to identify the port broadcast domain of the frame.

- **Port Overlapping** - You can use port overlapping to allow access to commonly shared network resources among different VLAN groups, such as file servers or printers.

- **Untagged VLANs** - Untagged (or static) VLANs are typically used to reduce broadcast traffic and to increase security. A group of network users assigned to a VLAN form a broadcast domain that is separate from other VLANs configured on the LB52xA-KIT. Packets are forwarded only between ports that are designated for the same VLAN. Untagged VLANs can be used to manually isolate user groups or subnets.

- **Port VID (PVID)** - A PVID is a VLAN ID assigned to untagged frames received on the interface. (Default: 1). If an interface is not a member of VLAN 1 and you assign its PVID to this VLAN, the interface will automatically be added to VLAN 1 as an untagged member. For all other VLANs, an interface must first be configured as an untagged member before you can assign its PVID to that group.

- **Link Type** - The Link Type determines the types of frames the port can accept. **Access** means the port can only receive or send untagged frame types. **Trunk** means that the port can only receive or send tagged frame types.

Port-Based VLAN

Click on **VLAN** under **Advanced** on the main menu to reach the VLAN advanced configuration page. Then, select the radio button for **Port-Based VLAN** to display the configuration options.

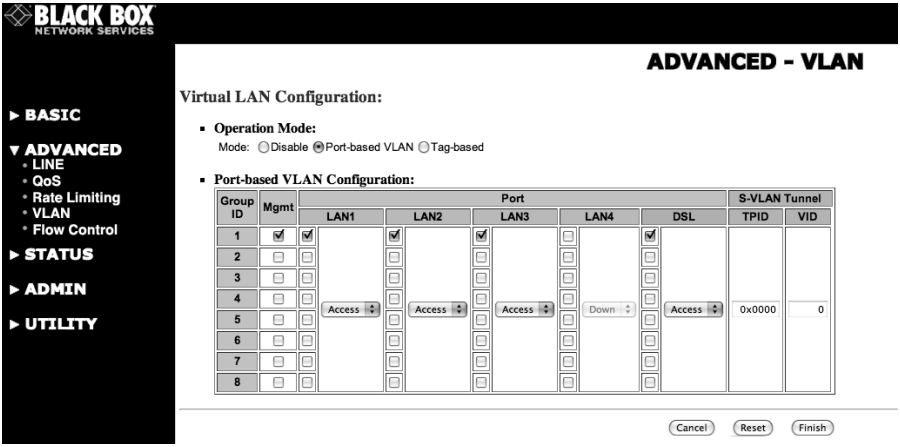

Figure 19. Port-Based VLAN page

Port-Based VLANs are VLANs where the packet forwarding decision is based on the destination MAC address and its associated port. When using port-based VLAN, the port is assigned to a specific VLAN independent of the user or system attached to the port. This means all users attached to the port should be members in the same VLAN. The network administrator typically performs the VLAN assignment. The port configuration is static and cannot be automatically changed to another VLAN without manual reconfiguration.

As with other VLAN approaches, the packets forwarded using this method do not leak into other VLAN domains on the network. After a port has been assigned to a VLAN, the port cannot send to or receive from devices in another VLAN.

4.3.3 Quality of Service (QoS)

Quality of Service (QoS) refers to both a network's ability to deliver data with minimum delay, and the networking methods used to control the use of bandwidth. Without QoS, all traffic data is equally likely to be dropped when the network is congested. This can cause a reduction in network performance and mark the network inadequate for time-critical application such as video-on-demand.

Click on **QoS** under Advanced on the main menu to reach the QoS advanced configuration page.

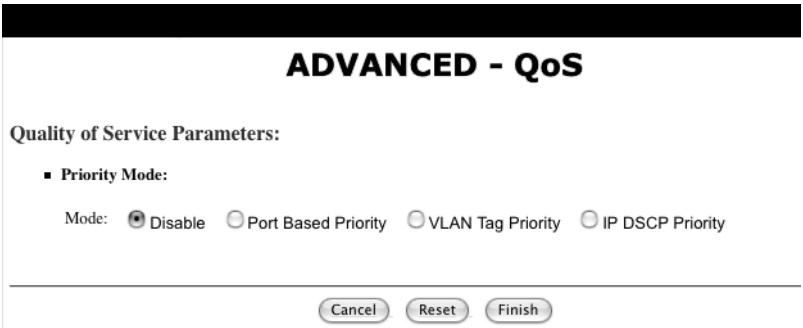

Figure 20. QoS page

QoS (Quality of Service) is used to decide which devices can get priorities to pass though the LB52xA-KIT once the bandwidth is exhausted or fully saturated.

There are three types of QoS priority modes: Port Based Priority, VLAN Tag Priority, and IP DSCP Priority. You can also disable the QoS function.

Port Based Priority

Click on **QoS** under **Advanced** on the main menu to reach the QoS advanced configuration page. Then, select the radio button for **Port Based Priority** to display the configuration options.

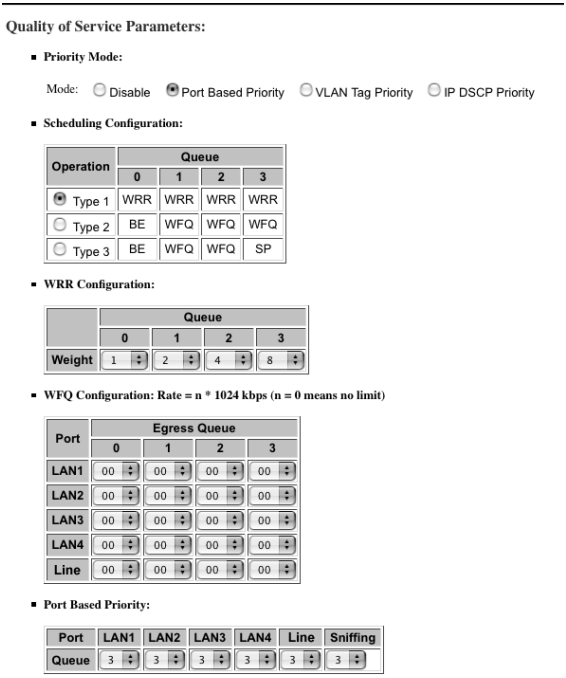
Quality of Service Parameters:
Priority Mode:
Mode: Disable Port Based Priority VLAN Tag Priority IP DSCP Priority
Scheduling Configuration:
Operation
Queue
0 1 2 3
Type 1 WRR WRR WRR WRR
Type 2 BE WFQ WFQ WFQ
Type 3 BE WFQ WFQ SP
WRR Configuration:
Queue
0 1 2 3
Weight 1 2 4 8
WFQ Configuration: Rate = n * 1024 kbps (n = 0 means no limit)
Port
Egress Queue
0 1 2 3
LAN1 00 00 00 00
LAN2 00 00 00 00
LAN3 00 00 00 00
LAN4 00 00 00 00
Line 00 00 00 00
Port Based Priority:
Port LAN1 LAN2 LAN3 LAN4 Line Sniffing
Queue 3 3 3 3 3 3

Figure 21. QoS - Port Based Priority page

Select the ports that the port-based priority rule should be applied. There are six ports to choose from: LAN1, LAN2, LAN3, LAN4, DSL and Sniffing.

The common setting tables are:

WRR configuration: Each queue type can setup the queue weight from 1 to 15.

WFQ configuration: Each ports and their queue type can set the bandwidth.

Scheduling Configuration.The LB52xA-KIT provides three combinations of four commonly used techniques: Type 1, Type 2 and Type 3. Select a type in the Scheduling Configuration section, then provide details in the corresponding table.

If you select **Type 1**, refer to “WRR Configuration” on page 43.

If you select **Type 2** or **Type 3**, refer to “WFQ Configuration” on page 43.

The **Queue** types are **Weight Round Robin (WRR)**, **Weighted Fair Queuing (WFQ)**, **Best Effort (BE)** and **Strictly Priority (SP)**. Refer to the following page for more information on how each Queue Type operates.

- **Weight Round Robin (WRR):** All received packets will be stored into Queue 1, Queue 2, Queue 3, and Queue 4. Assign a weight value for each queue. Then, WRR will re-assemble all packets from the four queues based on the weight assignments.

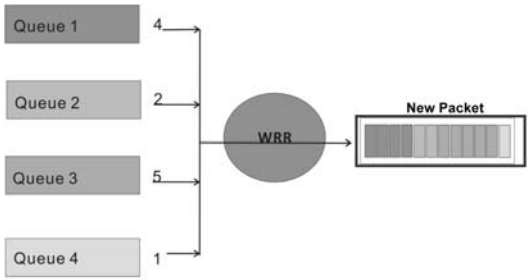

Figure 22. WRR Example

For example, Figure 22. shows the weight value of each queue, ranging from 4, 2, 5, and 1. When the LB52xA-KIT starts to process all of the packets in these queues with WRR, a new packet develops based on the weight assignments. Then, the LB522A-KIT sends out the new packet.

- **Weighted Fair Queuing (WFQ):** WFQ is a generalization of processor sharing, which allows several sessions to share the same link. Refer to “WFQ Configuration” on page 45 to assign the data size of each queue that can be accepted by each port.

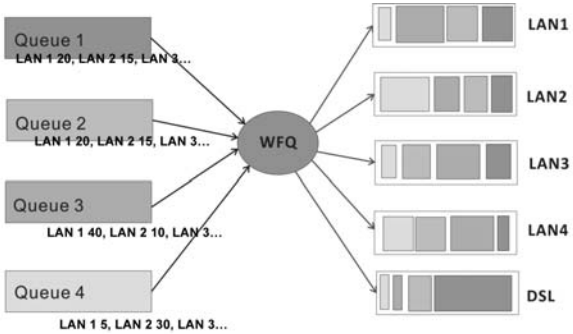

Figure 23. WFQ Example

- **Best Effort (BE):** The BE Queue Type is used for data applications that have low priority or the potential to delay. BE does not use traffic priority or weight assignments, therefore BE is not recommended for high priority data, such as video or voice.

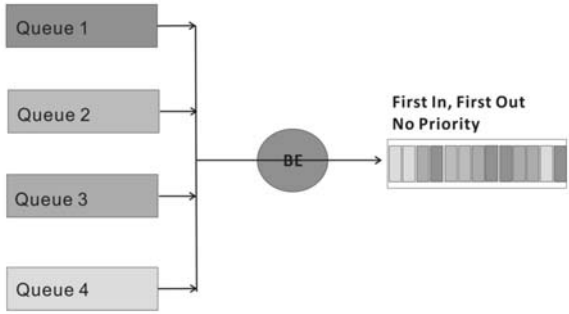

Figure 24. BE Example

- **Strictly Priority (SP):** The SP Queue Type uses queues that are based on priority only. SP transmits the highest priority queue first, then the next highest priority queue, and so on. However, if there is always some content in the highest priority queue, then the other packets in the rest of queues will not be sent until the highest priority queue is empty. The SP algorithm is preferred when the received packets contain some high priority data, such as voice and video.

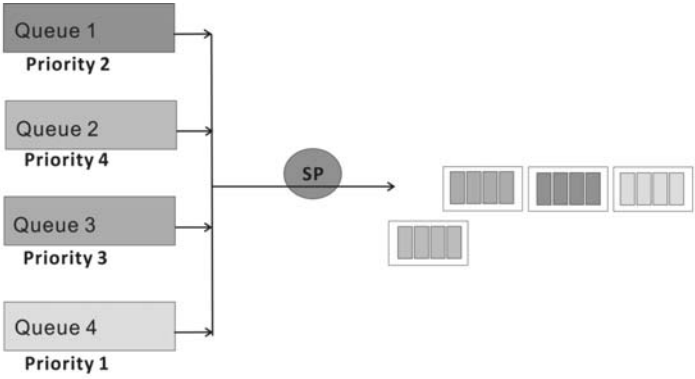

Figure 25. SP Example

WRR Configuration. If you selected **Type 1** in the Scheduling Configuration section, then provide information for the **WRR** table. Assign a weight value (from 1 to 15) to determine the priority for each queue.

- **WRR Configuration:**

	Queue			
	0	1	2	3
Weight	1	2	4	8

Figure 26. QoS - Port Based Priority - WRR Configuration

WFQ Configuration. If you selected **Type 2** or **Type 3** in the Scheduling Configuration section, then provide information for the **WFQ** table. Assign the bandwidth for each queue in each port.

- **WFQ Configuration: Rate = n * 1024 kbps (n = 0 means no limit)**

Port	Egress Queue			
	0	1	2	3
LAN1	00	00	00	00
LAN2	00	00	00	00
LAN3	00	00	00	00
LAN4	00	00	00	00
Line	00	00	00	00

Figure 27. QoS - Port Based Priority - WFQ Configuration

Port-Based Priority Table. For the last step, assign queues to their corresponding ports: LAN 1-4, DSL and Sniffing.

- **Port Based Priority:**

Port	LAN1	LAN2	LAN3	LAN4	Line	Sniffing
Queue	3	3	3	3	3	3

Cancel Reset Finish

Figure 28. QoS - Port Based Priority Table

VLAN Tag Priority

Click on **QoS** under **Advanced** on the main menu to reach the QoS advanced configuration page. Then, select the radio button for **VLAN Tag Priority** to display the configuration options.

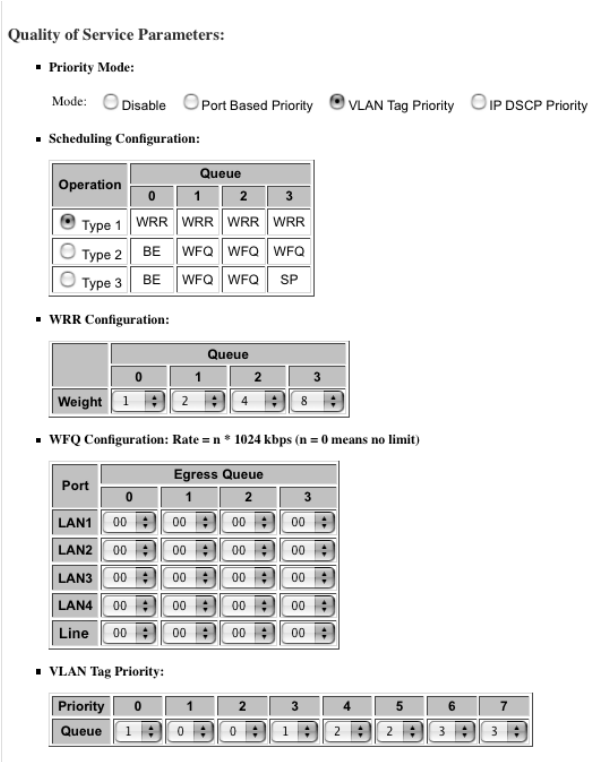
Quality of Service Parameters:
Priority Mode:
Mode: Disable Port Based Priority VLAN Tag Priority IP DSCP Priority
Scheduling Configuration:
Operation
Queue
0 1 2 3
Type 1 WRR WRR WRR WRR
Type 2 BE WFQ WFQ WFQ
Type 3 BE WFQ WFQ SP
WRR Configuration:
Queue
0 1 2 3
Weight 1 2 4 8
WFQ Configuration: Rate = n * 1024 kbps (n = 0 means no limit)
Port
Egress Queue
0 1 2 3
LAN1 00 00 00 00
LAN2 00 00 00 00
LAN3 00 00 00 00
LAN4 00 00 00 00
Line 00 00 00 00
VLAN Tag Priority:
Priority 0 1 2 3 4 5 6 7
Queue 1 0 0 1 2 2 3 3

Figure 29. QoS - VLAN Tag Priority page

VLAN Tag Priority uses the tag field information that has been inserted into an Ethernet frame. If a port has an 802.1Q-compliant device attached (such as this Ethernet Extender), these tagged frames can carry VLAN membership information.

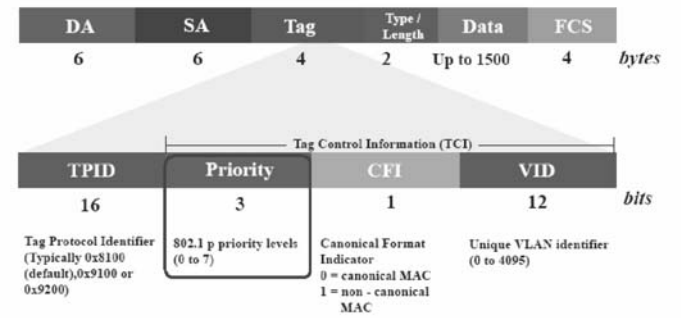

Figure 30. IEEE 802.1Q Tagged Frame for Ethernet

Priority defines the user priority level for different classes of traffic. There are 8 possible priority levels, with 0 being the lowest priority level and 7 being the highest level. Each Priority level can be set queue from 0 to 3.

Table 8: VLAN Tag Priority Levels

Priority Level	Traffic Type
0 (default)	Best Effort
1	Background
2	Spare
3	Excellent Effort
4	Controlled Load
5	Video, less than 100 milliseconds latency and jitter
6	Voice, less than 10 milliseconds latency and jitter
7	Network Control

Scheduling Configuration. The LB52xA-KIT provides three combinations of four commonly used techniques: Type 1, Type 2 and Type 3. Select a type in the Scheduling Configuration section, then provide details in the corresponding table.

If you select **Type 1**, refer to “WRR Configuration” on page 48.

If you select **Type 2** or **Type 3**, refer to “WFQ Configuration” on page 48.

WRR Configuration. If you selected **Type 1** in the **Scheduling Configuration** section, then provide information for the **WRR** table. Assign a weight value (from 1 to 15) to determine the priority for each queue. “Weight” determines how important the queue is; therefore, 15 is the most important queue and 0 is the least important queue.

- **WRR Configuration:**

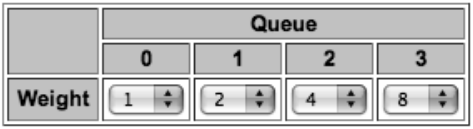

Figure 31. QoS - Tag Based Priority - WRR Configuration

WFQ Configuration. If you selected **Type 2** or **Type 3** in the **Scheduling Configuration** section, then provide information for the **WFQ** table. Assign the bandwidth for each queue in each port.

- **WFQ Configuration: Rate = n * 1024 kbps (n = 0 means no limit)**

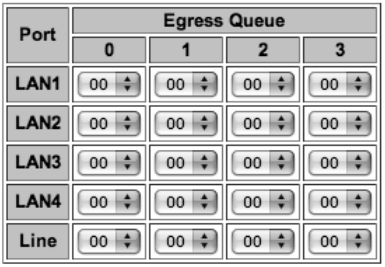

Figure 32. QoS - Tag Based Priority - WFQ Configuration

VLAN Tag Priority Table. Select a packet with an assigned priority to correspond with each queue.

- **VLAN Tag Priority:**

Figure 33. QoS - VLAN Tag Priority Table

Configuration Example. As an example, you can set the LB52xA-KIT to use Weighted Round-Robin (WRR) queuing that specifies a relative weight of each queue. WRR uses a predefined relative weight for each queue that determines the percentage of service time to provide each queue before moving on to the next queue. This prevents the head-of-line blocking that can occur with strict priority queuing.

Table 9: WRR Scheduling Configuration Example Values

Queue	0	1	2	3
Type 1	WRR	WRR	WRR	WRR
Weight	1	2	4	8

For this example, set up the WRR (Type 1) to share bandwidth by using scheduling weights 1, 2, 4 and 8 for queues 0 through 3 respectively.

Priority	0	1	2	3	4	5	6	7
Queue	1	0	0	1	2	2	3	3

According to the two tables above, the QoS values map to the Egress Queues as follows:

Queue	0	1	2	3
Weight	2	15	7	8

Priority	0	1	2	3	4	5	6	7
Queue	0	0	2	2	3	3	1	1

This example displays that:

- Packets with priority 0 and priority 1 go to Queue 0.
- Packets with priority 2 and priority 3 go to Queue 2.
- Packets with priority 4 and priority 5 go to Queue 3.
- Packets with priority 6 and priority 7 go to Queue 1.
- When, data flow traffic is jammed:

- Queue 1 Packets will go first because weight is equal to 15 (the biggest value).
- Queue 3 Packets will go next because the weight is the second largest value.
- Queue 2 Packets are the next after Queue 3 Packets.
- Queue 0 Packets are the last one to send.

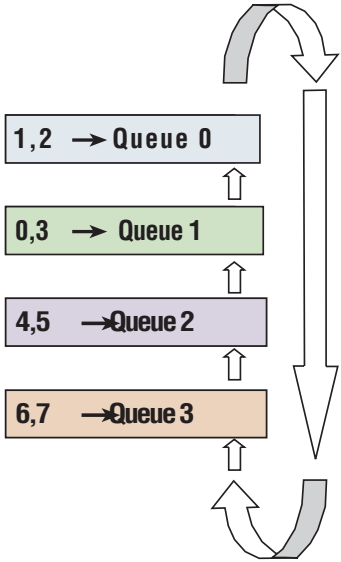

Figure 34. Service by WRR

IP DSCP Priority

Differentiated Services Code Point (DSCP) is the 6-bit field in the header of IP packets, and it is for packet classification purposes. The DSCP algorithm is based on IP DSCP fields in the IP header. There are 64 levels of priority degrees (0 to 63). Figure 35. shows the DS field:

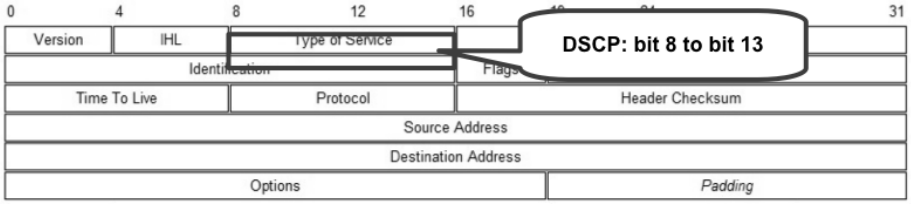

Figure 35. DSCP field

Click on **QoS** under **Advanced** on the main menu to reach the QoS advanced configuration page. Then, select the radio button for **IP DSCP Priority** to display the configuration options.

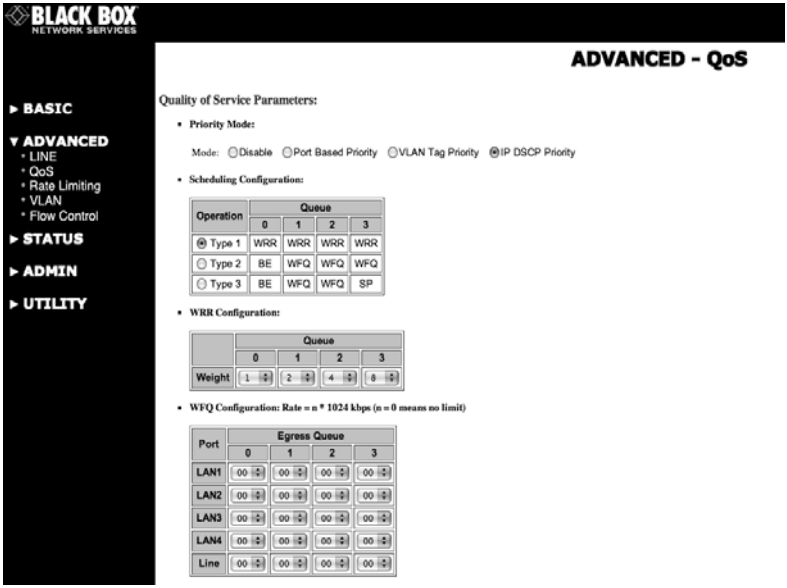

Figure 36. QoS advanced configuration

Scheduling Configuration. The LB52xA-KIT provides three combinations of four commonly used techniques: Type 1, Type 2 and Type 3. Select a type in the Scheduling Configuration section, then provide details in the corresponding table.

WRR Configuration. If you selected **Type 1** in the **Scheduling Configuration** section, then provide information for the **WRR** table. Assign a weight value (from 1 to 15) to determine the priority for each queue. "Weight" determines how important the queue is; therefore, 15 is the most important queue and 0 is the least important queue.

- **WRR Configuration:**

	Queue			
	0	1	2	3
Weight	1	2	4	8

Figure 37. QoS - IP DSCP Priority - WRR Configuration

WFQ Configuration. If you selected **Type 2** or **Type 3** in the **Scheduling Configuration** section, then provide information for the **WFQ** table. Assign the bandwidth for each queue in each port.

- **WFQ Configuration: Rate = n * 1024 kbps (n = 0 means no limit)**

Port	Egress Queue			
	0	1	2	3
LAN1	00	00	00	00
LAN2	00	00	00	00
LAN3	00	00	00	00
LAN4	00	00	00	00
Line	00	00	00	00

Figure 38. QoS - IP DSCP Priority - WFQ Configuration

IP DSCP Priority Table. Select the queue for each DSCP level. Each **DSCP value** (from 0 to 63) is mapped to a **Queue value** (from 0 to 3) from the drop-down list. The number 0 represents the lowest priority and number 3 represents the highest priority and according various queuing strategies to tailor performance to requirements.

IP DSCP Priority:

DSCP	Queue	DSCP	Queue	DSCP	Queue	DSCP	Queue
0	0	16	1	32	2	48	2
1	0	17	1	33	2	49	2
2	0	18	1	34	2	50	2
3	0	19	1	35	2	51	2
4	0	20	1	36	2	52	2
5	0	21	1	37	2	53	2
6	0	22	1	38	2	54	2
7	0	23	1	39	2	55	2
8	0	24	2	40	3	56	2
9	0	25	2	41	3	57	2
10	0	26	2	42	3	58	2
11	0	27	2	43	3	59	2
12	0	28	2	44	3	60	2
13	0	29	2	45	3	61	2
14	0	30	2	46	3	62	2
15	0	31	2	47	3	63	2

Figure 39. QoS - IP DSCP Priority page

IP DSCP Configuration Example. In this example, the selected operation is Type 3. For the Type 3 combination, set up Queue 1 and Queue 2 for WFQ configuration.

Port	Queue			
	0	1	2	3
LAN 1		5	10	
LAN 2		5	0	
LAN 3		0	10	
LAN 4		0	0	
DSL		5	0	

For this example, assume the following actions:

- Assign DSCP 1 to Queue 0.
- Assign DSCP 14 to Queue 1.
- Assign DSCP 34 to Queue 2.
- Assign DSCP 55 to Queue 3.

Figure 40. shows the results of the configuration for the LAN 1 port.

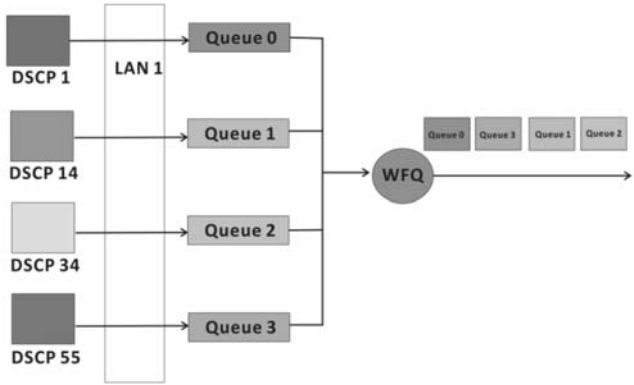

Figure 40. DSCP Configuration Example

4.3.4 Rate Limit

Click on **Rate Limit** under **Advanced** on the main menu to reach the Rate Control configuration page.

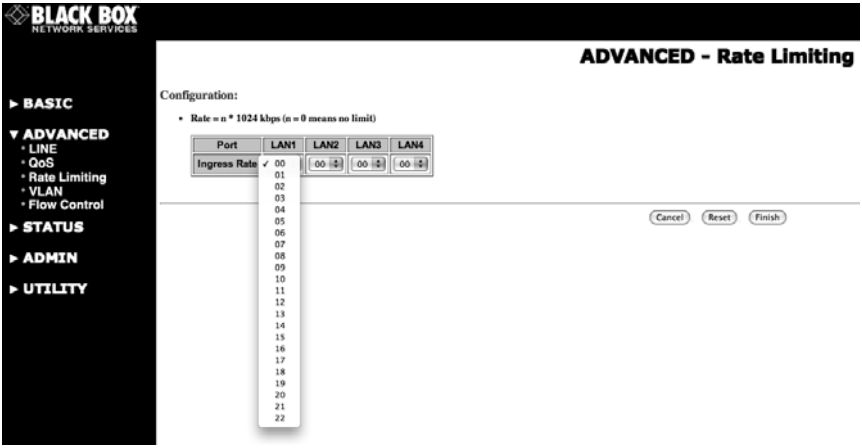

Figure 41. Rate Limit page

Limiting bandwidth to specific users and ports helps control network congestion, ensure high performance, create efficient networks, and prevent a small number of users from monopolizing network bandwidth.

Rate limiting control can be used to intelligently manage bandwidth allocation in the network. It can prevent one user or device from dominating the available network bandwidth, and it allows IT managers to allocate greater bandwidth to the departments and applications that need it.

You can set up the data rate limit on each port from 0 to 22. The data rates available are 00 (No limit), and the Ingress Rate x 1024kbps. The default setting is **No limit** on each port.

4.3.5 Flow Control

Click on **Flow Control** under **Advanced** on the main menu to reach the Flow Control configuration page. When the Flow Control option is enabled, the LB52xA-KIT controls the packet size.

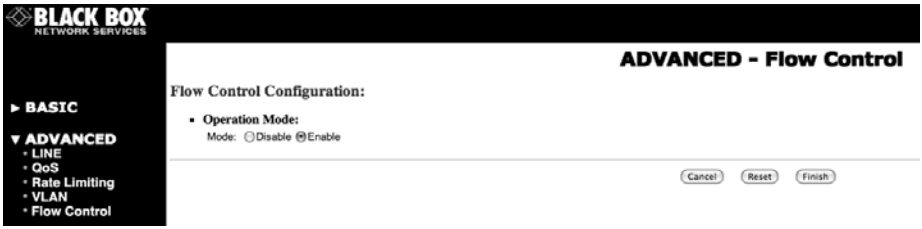

Figure 42. Flow Control page

4.4 STATUS OPTIONS

This section contains information for monitoring status options for the LB52xA-KIT via the WMI. The Status menu contains Line, Management, LAN, Performance and Syslog parameters.

4.4.1 LINE Status

The **LINE Status** includes information for the run-time device status, mode, Bit rate and Performance information such as SNR margin, atteunation and CRC error count.

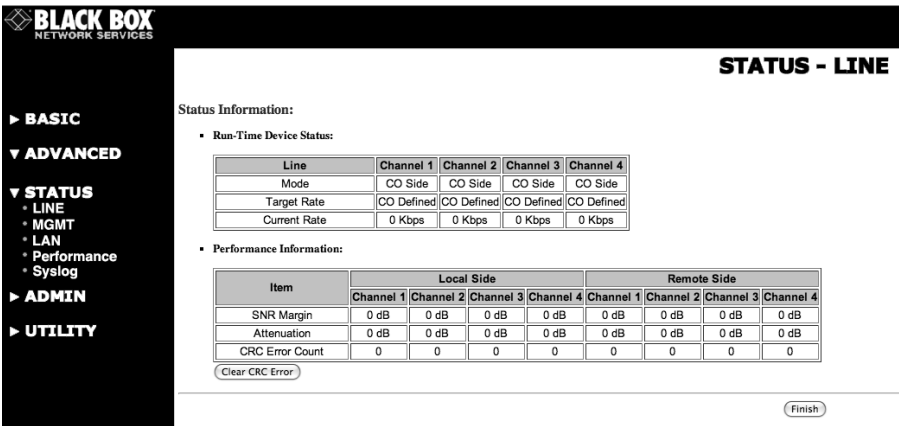
BLACK BOX
NETWORK SERVICES
STATUS - LINE
BASIC
ADVANCED
STATUS
LINE
MGMT
LAN
Performance
Syslog
ADMIN
UTILITY
Status Information:
Run-Time Device Status:
Line | Channel 1 | Channel 2 | Channel 3 | Channel 4
Mode | CO Side | CO Side | CO Side | CO Side
Target Rate | CO Defined | CO Defined | CO Defined | CO Defined
Current Rate | 0 Kbps | 0 Kbps | 0 Kbps | 0 Kbps
Performance Information:
Item | Local Side | Remote Side
Channel 1 | Channel 2 | Channel 3 | Channel 4 | Channel 1 | Channel 2 | Channel 3 | Channel 4
SNR Margin | 0 dB | 0 dB | 0 dB | 0 dB | 0 dB | 0 dB | 0 dB | 0 dB
Attenuation | 0 dB | 0 dB | 0 dB | 0 dB | 0 dB | 0 dB | 0 dB | 0 dB
CRC Error Count | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0
Clear CRC Error
Finish

Figure 43. LINE Status page (8-wire model shown)

If two LB52xA-KITs have been linked together, you can view their run-time line rate status and performance information from this screen. If you want to clear the performance data, click **Clear CRC Error**.

NOTE: The CPE line rate is determined by the CO setting.

4.4.2 Management Status

The **Management Status** page displays information about the Management port interface. You can view the general status of the Management interface and DHCP client table.

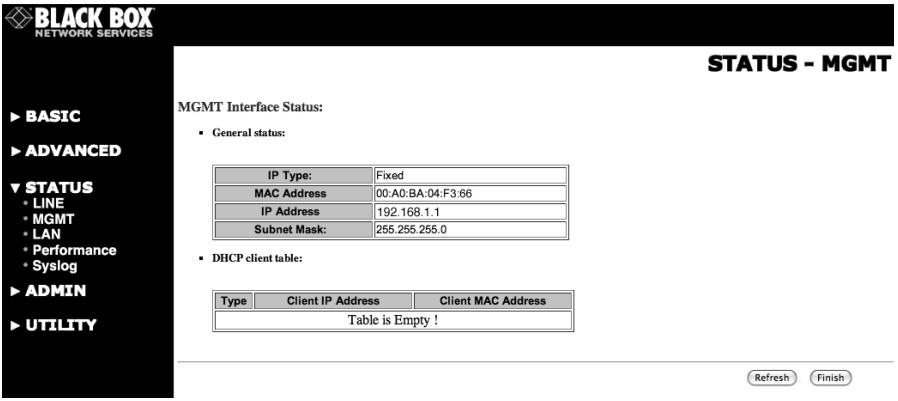

Figure 44. Management Status page

4.4.3 LAN Status

The **LAN Status** page displays information about a LAN port. The system will allow you to select which LAN port to view.

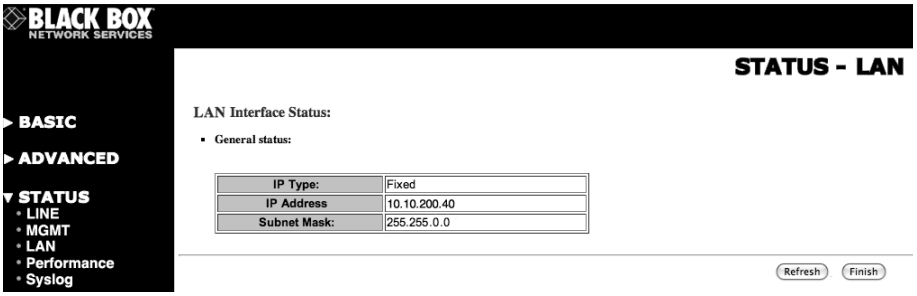

Figure 45. LAN Status page

4.4.4 Performance Status

The **Performance Status** page displays information about the uptime and errors of the system.

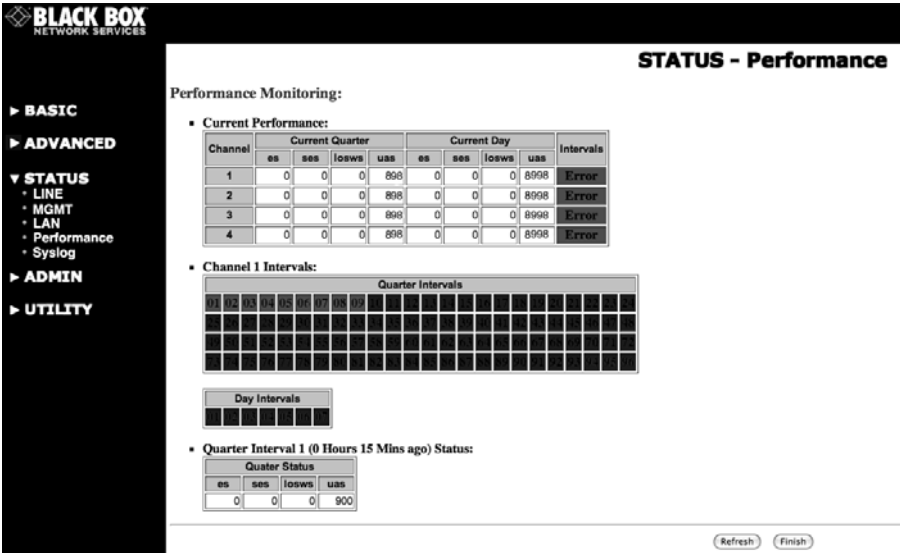

Figure 46. Performance Status page

4.5 ADMINISTRATION OPTIONS

This section allows you to configure administration options for Security, Simple Network Management Protocol (SNMP) and Remote System Log.

4.5.1 Security Administration

For system security, you should change the default user name and password during initial setup. Otherwise, unauthorized persons can access the LB52xA-KIT and change the parameters. Click **Security** in the **Administration** menu to set up the parameters.

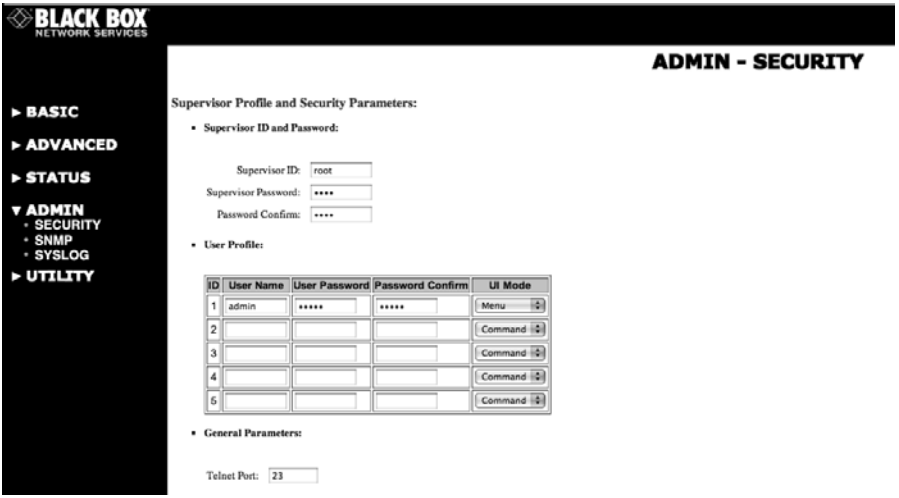

Figure 47. Security Administration page

User Profiles

For better security, change the **Supervisor ID** and **Supervisor Password** for the LB52xA-KIT. If you don't set them, all users will be able to access the LB52xA-KIT using the default Supervisor ID and Supervisor Password, which is *root*.

You can authorize five legal users to access the LB52xA-KIT via telnet or console only. There are two UI modes, menu driven mode and command mode to configure the LB52xA-KIT. The default user name and Password are *admin.* There are two UI modes, the WMI and the Telnet/Console mode to set up the LB52xA-KIT.

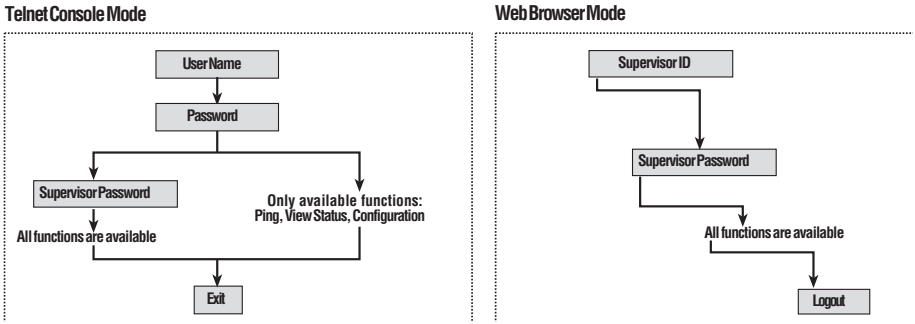

Figure 48. LB52xA-KIT configuration modes

Remote Management Hosts

The Remote Management Host section of the Security Administration page enables you to set up the legal IP addresses from which authorized persons can configure the LB52xA-KIT. This is the most secure way for the network administrator to set up the legal address of configuration (see Figure 49.).

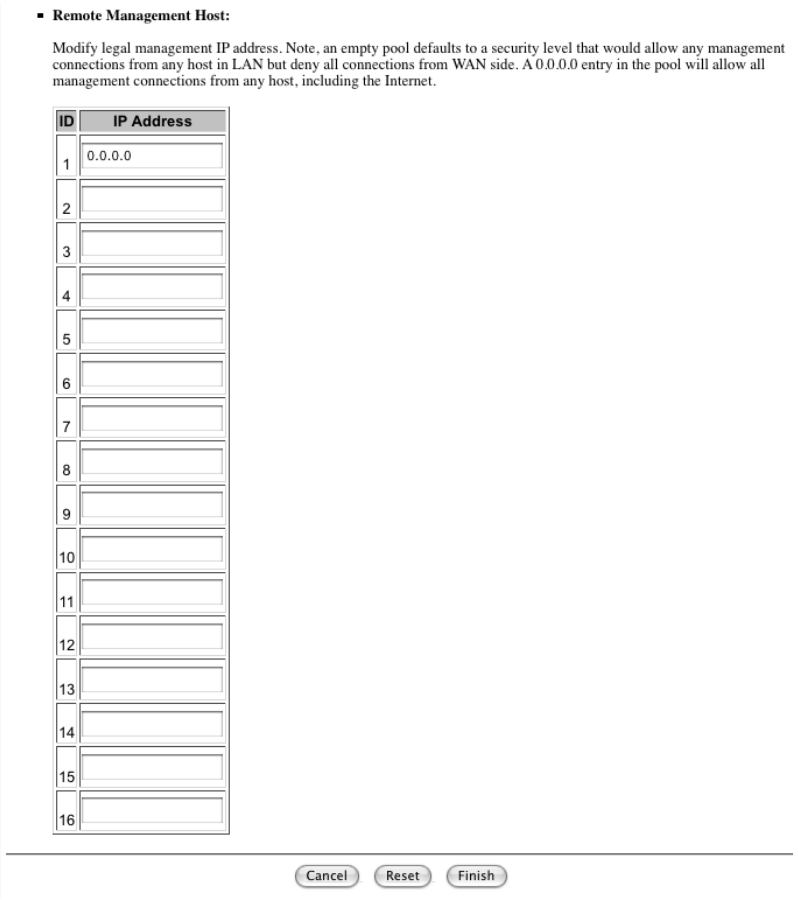

Figure 49. Remote Management Host section

A configuration of **0.0.0.0** will allow all hosts on Internet or LAN to access the LB52xA-KIT. If you leave the trusted host list completely blank, you will block all PCs on the WAN from accessing the LB52xA-KIT. On the other hand, only PCs in the LAN can access the LB52xA-KIT. If you type the exact IP address in the field, only that host can access the LB52xA-KIT.

Click **Finish** to commit your changes. The browser will prompt the configured parameters and check it before writing into NVRAM. Press **Restart** to reboot the LB52xA-KIT with the new settings. Click **Continue** to configure other options.

4.5.2 SNMP Administration

Simple Network Management Protocol (SNMP) provides for the exchange of messages between a network management client and a network management agent for remote management of network nodes. These messages contain requests to get and set variables that exist in network nodes in order to obtain statistics, set configuration parameters, and monitor network events. SNMP communications can occur over the LAN or WAN connection.

The LB52xA-KIT can generate SNMP traps to indicate alarm conditions, and it relies on SNMP community strings to implement SNMP security. This LB52xA-KIT support both MIB I and MIB II.

Click **SNMP** in the **Administration** menu to set up the parameters.

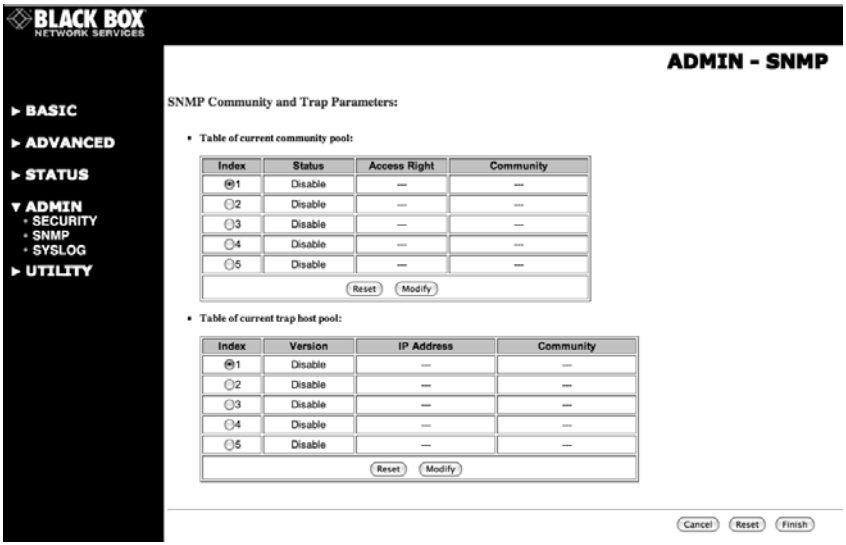

Figure 50. SNMP Administration page

Community Pool

An SNMP community is a group of devices and management stations running SNMP. It helps define where information is sent. The community name is used to identify the group. A SNMP device or agent may belong to more than one community. It will not request information from management stations that do not belong to one of its communities.

Table 10: Default SNMP Communities

Access Right	Community
Read	**public**
Write	**private**

Click **Modify** to set up community pools.

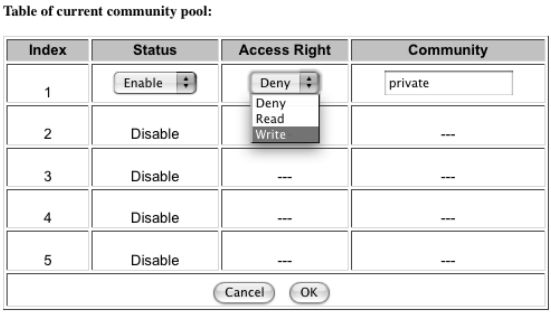

Figure 51. SNMP community pool configuration

In the table of the current community pool, you can set up access:

- **Status:** *Enable*–Turn on the SNMP function; *Disable*–Turn off the SNMP function
- **Access Right:** *Deny*–Restrict all access; *Read*–Read-only access; *Write*–Read/write access
- **Community:** The password for write access.

After configuring the community pool, click **Finish**. The browser will prompt the configured parameters and check it before writing into NVRAM. Press **Restart** to reboot the LB52xA-KIT with the new settings. Click **Continue** to configure other options.

Trap Host Pool

In the table of current trap host pool, you can set up the trap host. SNMP trap is an informational message sent from an SNMP agent to a manager. It is a management station (SNMP application) that receives traps. If you don't define a trap host pool, then no traps are issued.

Click **Modify** to set up the trap host pool.

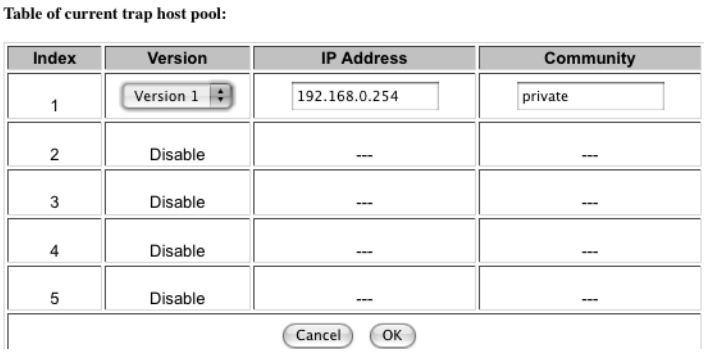

Figure 52. Trap host pool configuration

- **Version:** Select version for trap host. (Version 1 is for SNMPv1; Version 2 for SNMPv2; Disable–Turn off)
- **IP Address:** Enter the trap host IP address
- **Community:** Enter the community password.

Click **OK** to finish the setup. The browser will prompt the configured parameters and check it before writing into NVRAM. Press **Restart** to reboot the LB52xA-KIT with the new settings. Click **Continue** to configure other options.

4.5.3 Remote Syslog

Click **Remote Syslog** in the **Administration** menu to send the log information of the LB52xA-KIT to a remote site.

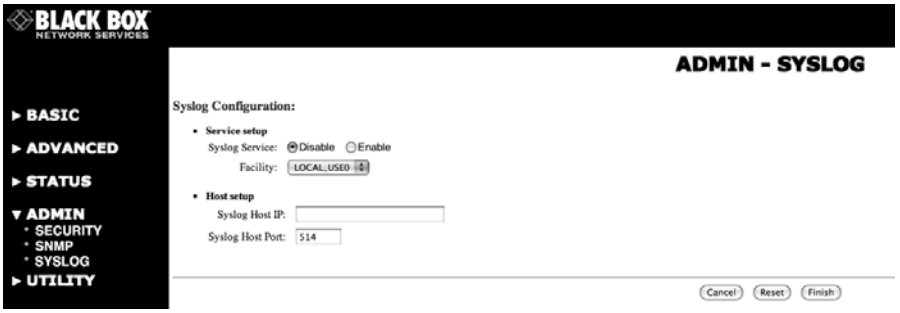

Figure 53. Remote Syslog configuration page

- Service Setup
  - **Mode:** Enable/Disable the remote syslog service
  - **Facility:** Select from LOCAL_USE0 to LOCAL_USE9 and SEC_AUTH
- Protocol Setup
  - **Server IP:** The IP address of the remote management server, where the logs will be sent
  - **Port:** The port number of the specific IP address

4.6 UTILITY OPTIONS

This section allows you to manage utility options for the LB52xA-KIT, including system information, the configuration tool, upgrade information, log out of the system, and restart the system.

4.6.1 System Information

To review system information, click **System Info** in the **Utility** menu.

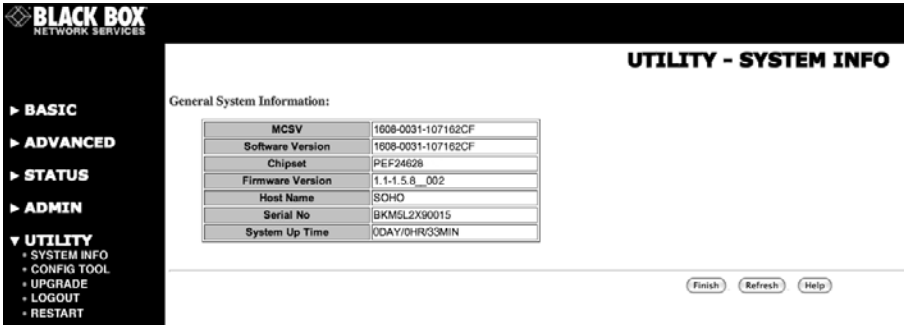

Figure 54. System Information page

You can check the **MCSV**, **Software Version**, **Chipset**, **Firmware Version**, **Host Name, Serial number** and **System Up Time**. The **System Up Time** item lets you know how long the LB52xA-KIT has been running since powering up.

4.6.2 Configuration Tool

The configuration tool has three options: **Load Factory Default**, **Restore Configuration**, and **Backup Configuration**. Click **Config Tool** in the **Utility** menu.

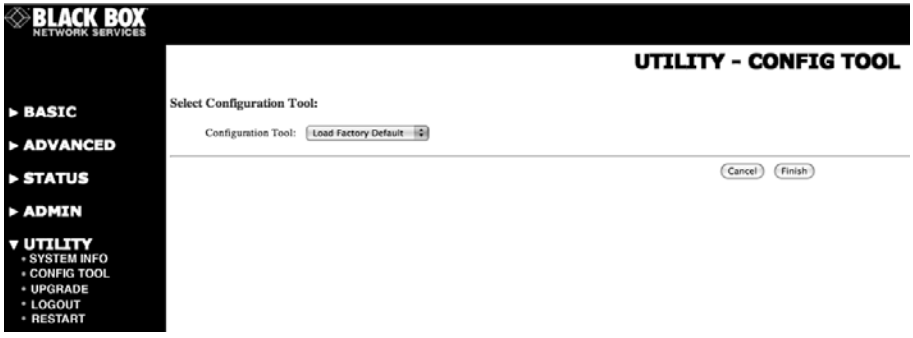

Figure 55. Configuration Tool page

Select the desired configuration function, then click **Finish**.

- **Load Factory Default:** The system will load the factory default parameters for the LB52xA-KIT.

NOTE: This option will change all of the settings back to factory default. You will lose all of your current settings.

- **Restore Configuration:** Use this option to easily recover the backup configuration. Click **Finish** after selecting Restore Configuration. Browse to the backup file then click **Finish** again. The LB52xA-KIT will automatically restore the saved configuration.
- **Backup Configuration:** After you configure the LB52xA-KIT with your desired settings, you can use the **Backup Configuration** option to save your LB52xA-KIT parameters in the PC. Select the **Backup Configuration** and then click **Finish**. Browse to the backup directory, and click **Finish** again. The LB52xA-KIT will automatically save the configuration.

4.6.3 Upgrade

You can update the firmware of LB52xA-KIT using the **Upgrade** function. Click **Upgrade** in the **Utility** menu.

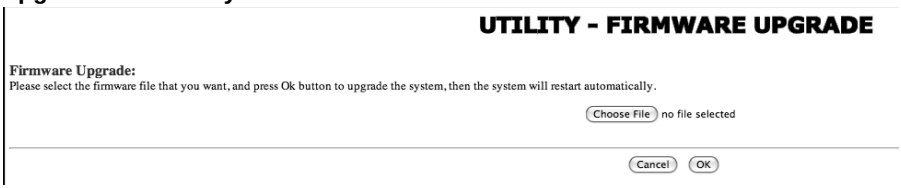
UTILITY - FIRMWARE UPGRADE
Firmware Upgrade:
Please select the firmware file that you want, and press Ok button to upgrade the system, then the system will restart automatically.
Choose File
no file selected
Cancel
OK

Figure 56. Upgrade page

Type the path and file name of the **Firmware** file you wish to upload to the LB52xA-KIT in text box. Or, you can click **Browse** to locate the file. Click **OK** to begin the upgrade process. The system will reboot automatically after finishing. (Firmware upgrades will only take effect after the system reboots).

After the firmware upgrade process is complete, click **System Info** in the Utility menu to verify your current firmware version number.

4.6.4 Logout

To exit the LB52xA-KIT Web Management Interface securely, click **Logout** in the **Utility** menu. You have to login with your password again after you log out. This is recommended after you finish a management session for security reasons.

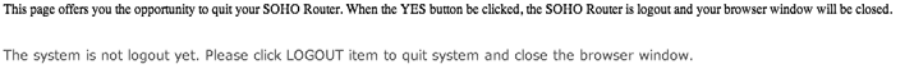
This page offers you the opportunity to quit your SOHO Router. When the YES button be clicked, the SOHO Router is logout and your browser window will be closed.
The system is not logout yet. Please click LOGOUT item to quit system and close the browser window.

Figure 57. Logout page

4.6.5 Restart

To reboot the LB52xA-KIT, click **Restart** in the **Utility** menu, then click the **Restart** button.

This page offers you the opportunity to restart your SOHO Router. When the restart button be clicked, the SOHO Router is restarting and your browser session will be disconnected. This may appear as if your browser session is hungup. After the server restarts, you may either press your browser's reload button, or close your browser and re-open it several minutes later.
!!
Cancel
Restart

Figure 58. Restart page

The following message displays:

Save configuration successfully.
The system will reboot automatically in 5 seconds.
The LAN IP 10.10.30.215 has been changed to 192.168.1.171!
Please close your browser and re-open it one minute later.

Figure 59. Restart page

5. CONSOLE AND TELNET CONFIGURATION

This chapter provides information for configuring the LB52xA-KIT by using the serial console with Telnet.

5.1 LOGIN TO THE CONSOLE INTERFACE

The console port is a RJ-48C connector that provides a connection to a PC for monitoring and configuring the LB52xA-KIT. Use the supplied serial cable with a female DB-9 connector to connect to the serial port of PC, and connect the RJ-48C module jack connector to the LB52xA-KIT's console port. Start your terminal emulation program (such as Hyper Terminal) and configure the communication parameters. Use the settings shown in the table below to log into the console:

Table 11: Console settings

Parameter	Value
Baud rate	**6900**
Data Bits	**8**
Parity Check	**None**
Stop Bits	**1**
Flow-control	**None**

After you enter the settings for the console, press the spacebar until the login screen appears. When you see the login screen, you can log on to the LB52xA-KIT. Enter admin for both the Username and Password.

5.2 LOG IN USING TELNET

The LB52xA-KIT also supports Telnet for remote management. Connect the Ethernet cable to the Management port of LB52xA-KIT to your computer. The Management LED on the front panel of the LB52xA-KIT will light up. Start your Telnet client with VT100 terminal emulation and connect to the management IP of the LB52xA-KIT. Wait for the login prompt to display. Enter your username and password. When you see the login screen, you can log on to the LB52xA-KIT. Enter **admin** for both the Username and Password.

*NOTE: The default IP address is **192.168.1.1**. The line command is "**telnet 192.168.1.1**" in DOS mode.*

5.3 INTERFACE COMMANDS

Before changing the configuration, familiarize yourself with the operations list in the following table:

Table 12: Interface commands

Keystroke	Description
↑ or I	Move to the field above in the same level menu.
↓ or K	Move to field below in the same level menu.
← or J	Move back to the previous menu.
→ or L or [ENTER]	Move forward to the submenu.
[HOME] or U	Move to the first field.
[END] or O	Move to the last field.
[TAB]	Choose another parameter.
Ctrl + C	Quit configuring the item.
Ctrl +Q	Access help.

The LB52xA-KIT uses a menu-driven interface for serial console and Telnet management. This interface displays all available commands for configuring the Ethernet Extender.

Figure 60. shows an example of the menu-driven interface. In the menu, scroll up/down by pressing the **I/K keys**. Select one command by pressing the **L key**. Go

back to a higher level of the menu by pressing the **J key**. You can also scroll to the top/bottom with the **U/O keys**.

For example, to show the system information, log on to the LB52xA-KIT. Press the **K key** twice and select the **show** command with the **L key**. Select the **system** command in the submenu. The system will display general information. You may also use the **Enter key** to select a command.

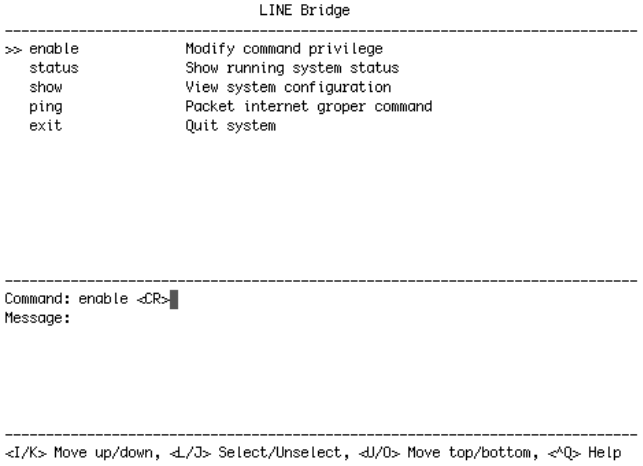

Figure 60. Console/Telnet Menu

5.4 WINDOW STRUCTURE

From top to bottom, the window is divided into four parts:

- **Product name:** LINE Bridge
- **Menu field:** The menu tree prompts on this field. Symbol "**>>**" indicates the cursor place.
- **Configuration field:** Configure the parameters in this field; < *parameter* > indicates the parameters you can choose and < *more…*> indicates that there are more options in the submenu.
- **Footer:** Operation commands for help.

5.5 MAIN MENU TREE

The commands available in the main menu tree depend on if you have logged in using a supervisor password (authorized user) or not (unauthorized user). An authorized user can access all of the configuration commands in the subdirectories using the **enable** command. Unauthorized users cannot change any configurations but can view the status and information for the LB52xA-KIT. They may also use the **ping** command to check the LB52xA-KIT's connection.

5.5.1 Menu tree for authorized users

Authorized users may login to the LB52xA-KIT with a supervisor password to obtain access to all of the configuration commands (see Figure 61.).

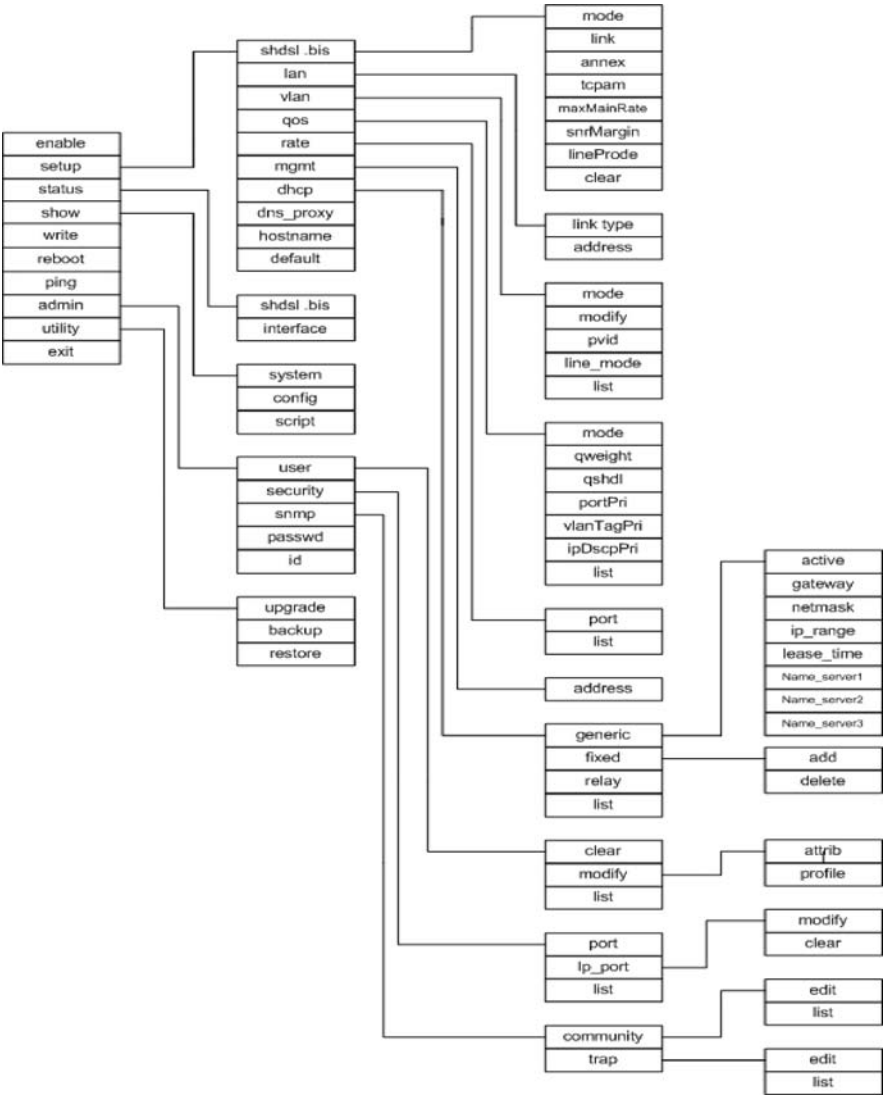

Figure 61. Menu tree for authorized users

```
                                LINE Bridge
--------------------------------------------------------------------------------
>> enable               Modify command privilege
   setup                Configure system
   status               Show running system status
   show                 View system configuration
   write                Update flash configuration
   reboot               Reset and boot system
   ping                 Packet internet groper command
   admin                Setup management features
   utility              TFTP upgrade utility
   exit                 Quit system


--------------------------------------------------------------------------------
Command: enable <CR>_
Message:




--------------------------------------------------------------------------------
<I/K> Move up/down, <L/J> Select/Unselect, <U/O> Move top/bottom, <^Q> Help
```

Figure 62. Main screen for authorized users

5.6 MENU TREE FOR UNAUTHORIZED USERS

Unauthorized users may access the following configuration commands for the LB52xA-KIT.

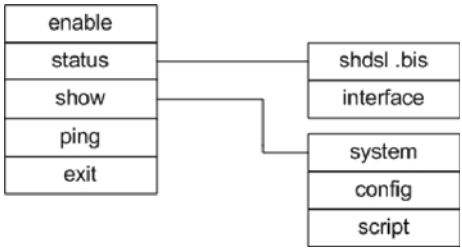

Figure 63. Main menu for unauthorized users

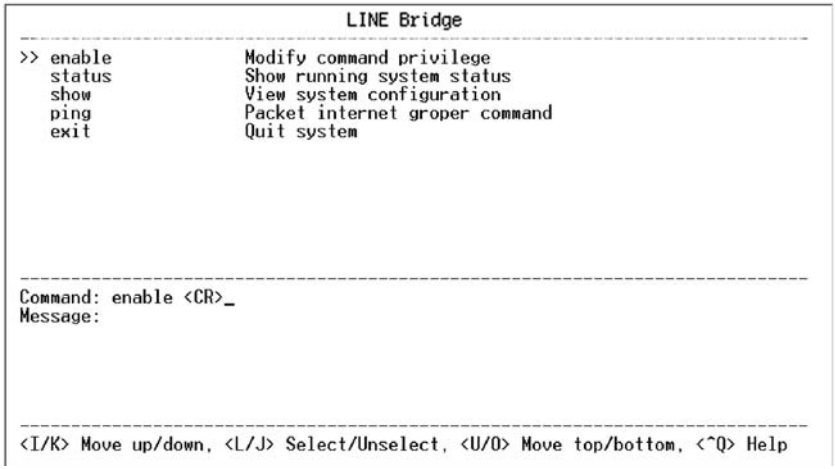

Figure 64. Main screen for unauthorized users

5.7 ENABLE COMMAND MENU

The **enable** command menu lists commands for setting up the LB52xA-KIT. Move the cursor " **>>**" to **enable** and press Enter. Type the supervisor password, which is **root**.

```
---------------------------------------------------------------------
Command: enable <CR>
Message: Please input the following information.
Supervisor password: ****
---------------------------------------------------------------------
```

In the **enable** sub menu, you can set up management features and upgrade software, back up the system configuration and restore the system configuration via utility tools.

To save your changes, you must write the new configuration to NVRAM and reboot the LB52xA-KIT to work with the new settings.

When you first login to the LB52xA-KIT with the supervisor password, the main menu displays:

```
>> enable    Modify command privilege
   setup     Configure system
   status    Show running system status
```

```
show      View system configuration
write     Update flash configuration
reboot    Reset and boot system
ping      Packet internet groper command
admin     Setup management features
utility   TFTP upgrade utility
exit      Quit system
```

The table below explains the commands available in the main menu:

Table 13: Enable Command Menu

Command	Description
enable	**Change the configuration and write changes to nonvolatile RAM (NVRAM)**
setup	**Initially configure the LB52xA-KIT**
status	**View the status of the LB52xA-KIT**
show	**Show the system and configuration**
write	**Update flash configuration. After you have completed all desired changes, make sure to write the new configuration to NVRAM. Use the write command to save your changes and reboot the system or all of your changes will not take effect.**
reboot	**Reset and reboot system. After you have completed all desired changes, make sure to write the new configuration to NVRAM. Use the reboot command to restart the system or all of your changes will not take effect.**
ping	**Check the connection to the LB52xA-KIT**
admin	**Set up advanced management features.**
utility	**Upgrade software and backup/restore the current configuration**
exit	**Log out of the system**

5.8 SETUP COMMAND MENU

The **setup** command menu lists commands for initially configuring the LB52xA-KIT. Move the cursor " **>>**" to **setup** in the main menu and press Enter.

When you enter the **setup** command, the following menu displays:

```
>> line       Configure line parameters
   lan        Configure LAN interface profile
   vlan       Configure virtual LAN parameters
   qos        Configure Quality of Service parameters
   rate       Configure Rate Control parameters
   Manage-    Configure management interface profile
   ment
   dhcp       Configure DHCP parameters
   dns_proxy  Configure DNS proxy parameters
   hostname   Configure local host name
   default    Restore factory default settings
```

5.8.1 Line

The **line** command menu lists commands for setting up the line port. Move the cursor "**>>**" to **line** in the **setup** menu and press Enter. The following menu displays:

```
>> mode          Configure line mode
   link          Configure line link
   annex         Configure line annex type
   tcpam         Configure line TCPAM type
   maxMainRate   Configure line max main data rate
   snrMargin     Configure line SNR margin
   lineProbe     Configure line line probe
   clear         Clear current CRC error count
```

The table below shows the options available within the **line** command menu:

Table 14: Line Options

Menu	Options
Mode	☐ **STU-C** ☐ **STU-R**
Link Type	☐ **2-wire** ☐ **4-wire** ☐ **8-wire**

Table 14: Line Options

Menu	Options
Annex	☐ **AF** ☐ **BG**
TCPAM	☐ **Auto** ☐ **TCPAM-16** ☐ **TCPAM-32** ☐ **TCPAM-64**
Max Main Rate	**(3-89)**
SNR Margin	**(-10-21)**
Line Probe	☐ **Disable** ☐ **Enable**

Mode

There are two types of Line mode:

- **STU-C**: Central Office (CO) terminal
- **STU-R:** Customer Premise Equipment (CPE)

Link

Select the line type for your model. Line type means how many wires you want to use on the Ethernet connection. For example, you can select 2-wire, 4-wire or 8-wire line type for the 8-wire model.

Table 15: Line Type Chart

		Line Type		
		2-wire	**4-wire**	**8-wire**
Model Type	**2-wire model**	●		
	4-wire model	●	●	
	8-wire model	●	●	●

Annex Type

Enter the appropriate **Annex** type. **Annex AF** describes the transmission and performance requirements for North America. **Annex BG** describes performance and transmission requirements for Europe.

TCPAM Type

TCPAM (Trellis Coded Pulse Amplitude Modulation) is the standard used for line coding. Select the **TCPAM** type. **Auto** is the default option for **TCPAM**.

Maximum Main Rate

Select the line rate for your model. The main rate is the multiple of 64kbps, 128kbps, or 256kbps depending on your model type. Use the table below to determine the best main rate for your model.

Table 16: Main Rate Table

Model Type	Multiple	TCPAM - 16 = 3-60	TCPAM - 32 = 12-89	TCPAM - 128 = 2-239
LB522A-KIT 2-wire	**64**	**192-3840**	**768-5696**	**128-15296**
LB524A-KIT 4-wire	**128**	**384-7680**	**1536-11392**	**256-30592**
LB528A-KIT 8-wire	**256**	**768-15360**	**3072-22784**	**512-61184**

SNR Margin

SNR margin is an index of line connection quality. Generally, you won't need to change the SNR Margin. You can view the actual **SNR margin** in **status** command menu. You will experience better line connection quality for larger SNR margin values.

For example, if you set the SNR margin as 5, the line connection will drop and reconnect when the SNR margin is lower than 5. On the other hand, the device will reduce the line rate and reconnect for better line connection quality. You may select the SNR margin from the range -10 to 21.

Line Probe

For adaptive mode applications, set the **Line Probe** to **Enable**. The LB52xA-KIT will adapt the data rate according to the line status. For all other applications, set the **Line Probe** to **Disable**.

Clear

Use the **clear** command to reset the CRC error count.

5.8.2 LAN

The **lan** command menu lists commands for setting up the LAN ports. Move the cursor " **>>**" to **lan** in the **setup** menu and press Enter.

```
--------------------------------------------------------------------------------
Command: setup lan <1~1>
Message: Please input the following information.
```

```
 Interface number <1~1>: 1
--------------------------------------------------------------------------------
```

The default interface number is 1.

You can configure the Link type, LAN IP address and subnet mask for the LAN interface.

```
>> link_type    Configure Link type
   address      LAN address and subnet mask
```

The table below shows the options available within the lan command menu:

Table 17: LAN Options

Menu	Options
Link Type	☐ **Disable** ☐ **Dynamic** ☐ **Static**
IP Address	
Subnet Mask	

```
--------------------------------------------------------------------------------
Command: setup lan 1 link_type <Disable|Dynamic|Static>
 Message: Please input the following information.
 Link type (TAB Select) <Disable>:
--------------------------------------------------------------------------------
```

Select the *lan 1 link_type* as **Disable**, **Dynamic** or **Static.** Then, select **address** from the **lan** menu:

```
--------------------------------------------------------------------------------
 Command: setup lan 1 address <ip> <netmask>
 Message: Please input the following information.
 IP address (ENTER for default) <192.168.2.1>:
Subnet mask (ENTER for default) <255.255.255.0>:
--------------------------------------------------------------------------------
```

Set the LAN IP address and subnet mask. The default IP Address is **192.168.2.1** and the default subnet mask is **255.255.255.0**.

5.8.3 VLAN

Virtual LAN (VLAN) is defined as a group of devices on one or more LANs that are configured so that they can communicate as if they were attached to the same wire;

when in fact they are located on a number of different LAN segments. Because VLAN is based on logical instead of physical connections, it is extremely flexible.

You can setup the Virtual LAN (VLAN) parameters in **VLAN** command. The LB52xA-KIT supports VLAN-to-PVC only for bridge mode operation, i.e., the VLAN spreads over both the CO and CPE sides, where there is no layer 3 routing involved. The unit supports up to 8 active VLANs with shared VLAN learning (SVL) bridge out of 4096 possible VLANs specified in IEEE 802.1Q.

The **vlan** command menu lists commands for setting up the line port. Move the cursor " **>>**" to **vlan** in the **setup** menu and press Enter. The following menu displays:

```
>> mode          Trigger virtual LAN function
   modify        Modify virtual LAN table
   pvid          Modify port default VID
   link_mode     Modify port link type
   list          Show VLAN configuration
```

To activate the VLAN function, move the cursor "**>>**" to **mode** and press Enter. The products support two types of VLAN: **802.1Q** and **Port-Based**.

802.1Q defines the operation of VLAN bridges that permit the definition, operation, and administration of VLAN topologies within a bridged LAN infrastructure. **Port-Based VLANs** are VLANs where the packet forwarding decision is based on the destination MAC address and its associated port.

Mode

You can choose from two types of VLANs: **802.1Q Tag-Based VLAN** or **Port Based VLAN**. If you are not going to use the VLAN function, set this option to **Disable**.

```
--------------------------------------------------------------------------------
 Command: setup vlan mode <Disable|8021Q|Port>
 Message: Please input the following information.
Trigger VLAN function (TAB Select) <Disable>:
--------------------------------------------------------------------------------
```

The table below shows the options available within the VLAN mode command menu:

Table 18: VLAN Mode Options

Menu	Options
VLAN Mode	☐ Disable ☐ 802.1Q Tag VLAN ☐ Port-Based VLAN

802.1Q VLAN. To modify the VLAN rule, move the cursor to modify and press Enter.

```
--------------------------------------------------------------------------------
 Command: setup vlan modify <1~8> <0~4094> <string>
 Message: Please input the following information.

VLAN table entry index <1~8>: 1
 VID value (ENTER for default) <1>: 10
 VLAN port membership (ENTER for default) <111111>:
--------------------------------------------------------------------------------
```

The VLAN Port membership is represented with 1 or 0. VLAN port membership is a 6-digit binary number in which bit 0 to bits 5 represent LAN1 to LAN4, line and Sniffing ports respectively.

For example: [`setup vlan modify 1 10 111111`] means use index as 1 , VID = 10 and all six ports are the same membership (VLAN ID=10).

Use the **pvid** command to change the member port to untagged members:

```
--------------------------------------------------------------------------------
 Command: setup vlan pvid <1~6> <1~4094>
 Message: Please input the following information.

 Port index <1~6>:
VID value (ENTER for default) <1>:
--------------------------------------------------------------------------------
```

PVID (Port VID) is an untagged member from 1 to 4094 for the default VLAN.

For example:

[set vlan pvid 1 100]

[set vlan pvid 2 100]

[set vlan pvid 3 100]

[set vlan pvid 4 100]

[set vlan pvid 5 100]

[set vlan pvid 6 100]

This example shows that all untagged members of all ports all have the same membership (VLAN ID=100).

To modify the link type of the port, move the cursor to **link_mode** and press Enter. There are two types of link: **access** and **trunk**. A **Trunk** link will send the tagged packet form the port. An **Access** link will send an untagged packet from the port. The port index 1 to 4 represents LAN ports. Index 5 represents line, and index 6 represents Sniffing.

```
--------------------------------------------------------------------------------
 Command: setup vlan link_mode <1~6> <Access|Trunk>
 Message: Please input the following information.
 Port index <1~6>: 1
 Port link type (TAB Select) <Access>:
--------------------------------------------------------------------------------
```

Table 19 shows the options available within the 802.1Q Tag VLAN command menu.

Access	**The port can receive or send untagged packets.**
Trunk	**The port can receive or send tagged packets.**

Table 19: 802.1Q VLAN Options

		1	2	3	4	5	6
No	**VID**	**LAN1**	**LAN2**	**LAN3**	**LAN4**	**Line**	**Sniffing**
1							
2							
3							
4							
5							
6							
7							

Table 19: 802.1Q VLAN Options

		1	2	3	4	5	6
No	**VID**	**LAN1**	**LAN2**	**LAN3**	**LAN4**	**Line**	**Sniffing**
8							
PVID							
Link Type		☐ Access ☐ Trunk	☐ Access ☐ Trunk	☐ Access ☐ Trunk	☐ Access ☐ Trunk	☐ Access ☐ Trunk	☐ Access ☐ Trunk

Port-Based VLAN. With port-based VLAN, the port is assigned to a specific VLAN independent of the user or system attached to the port. This means all users attached to the port should be members in the same VLAN. The network administrator typically performs the VLAN assignment. The port configuration is static and cannot be automatically changed to another VLAN without manual reconfiguration.

You can set up Port-Based VLAN using the method for 802.11Q. However, VID, PVID or link type do not matter for Port-Based VLAN. Use the **list** command to check the status of the VLAN.

```
--------------------------------------------------------------------------------
Virtual LAN Parameter
 VLAN Mode                    : Port-Based VLAN
Virtual LAN Table
 No LAN1 LAN2 LAN3 LAN4  Line Sniffing
 --   ----  ----  ----   ----  ---- --------
  1   1   1    1   1    1    1
  2   -    -    -    -    -    -
  3   -    -    -    -    -    -
  4   -    -    -    -    -    -
  5   -    -    -    -    -    -
  6   -    -    -    -    -    -
  7   -    -    -    -    -    -
  8   -    -    -    -    -    -
 --------------------------------------------------------------------------------
```

5.8.4 QoS

Quality of Service (QoS) refers to both a network's ability to deliver data with minimum delay, and the networking methods used to control the use of bandwidth. Without QoS, all traffic date is equally likely to be dropped when the network is congested. This can cause a reduction in network performance and mark the network inadequate for a time-critical application such as video-on-demand.

The **qos** command menu lists commands for managing traffic. Move the cursor "**>>**" to **qos** in the **setup** menu and press Enter. The following menu displays:

```
>> mode          Trigger Quality of Service function
   qSchdl        Modify queue schedule type
   qweight       Modify queue weight
   q0GrssRt      Modify queue 0 egress rate
   q1GrssRt      Modify queue 1 egress rate
   q2GrssRt      Modify queue 2 egress rate
   q3GrssRt      Modify queue 3 egress rate
   portPri       Modify port priority
   vlanTagPri    Modify VLAN TAG priority
   ipDscpPri     Modify IP DSCP priority
   list          Show QoS configuration
```

Mode

You can choose from three types of QoS: **Port-Based**, **VLAN Tag**, and **IP DSCP**. If you are not going to use the QoS function, set this option to **Disable**.

```
-------------------------------------------------------------------------------
 Command: setup qos mode <Disable|PortBased|VlanTag|IpDscp>
 Message: Please input the following information.
 Trigger qoS function (TAB Select) <Disable>:
-------------------------------------------------------------------------------
```

The table below shows the options available within the **QoS mode** command menu:

Table 20: QoS Mode Options

Menu	Options
QoS Mode	☐ Disable ☐ Port-Based ☐ VLAN Tag ☐ IP DSCP

Queue Schedule

There are three types of queue schedule. Select from **Type 1**, **Type 2**, or **Type 3**. Table 21 explains the schedule types:

Table 21: Queue Schedule Types

Queue	0	1	2	3
Type 1	**WRR**	**WRR**	**WRR**	**WRR**
Type 2	**BE**	**WFQ**	**WFQ**	**WFQ**
Type 3	**BE**	**WFQ**	**WFQ**	**SP**

```
--------------------------------------------------------------------------------
Command: setup qos qSchdl <Type1|Type2|Type3>
Message: Please input the following information.
Operation type (TAB Select) <Type1>: Type1
--------------------------------------------------------------------------------
```

The **Queue** types are **Weight Round Robin (WRR)**, **Weighted Fair Queuing (WFQ)**, **Best Effort (BE)**, and **Strictly Priority (SP)**.

- **Weight Round Robin (WRR):** All received packets will be stored into Queue 1, Queue 2, Queue 3, and Queue 4. Assign a weight value for each queue. Then, WRR will re-assemble all packets from the four queues based on the weight assignments.
- **Weighted Fair Queuing (WFQ):** WFQ is a generalization of processor sharing, which allows several sessions to share the same link.
- **Best Effort (BE):** The BE Queue Type is used for data applications that have low priority or the potential to delay. BE does not use traffic priority or weight assignments, therefore BE is not recommended for high priority data, such as video or voice.

Strictly Priority (SP): The SP Queue Type uses queues that are based on priority only. SP transmits the highest priority queue first, then the next highest priority queue, and so on. However, if there is always some content in the highest priority queue, then the other packets in the rest of queues will not be sent until the highest priority queue is

empty. The SP algorithm is preferred when the received packets contain some high priority data, such as voice and video.

Table 22: Queue Schedule Options

Menu	Options
Queue Schedule	☐ Type 1 ☐ Type 2 ☐ Type 3

Queue Weight

This setting configures the weight value for each queue.

```
--------------------------------------------------------------------------------
Command: setup qos qweight <0~3> <1~15>
Message: Please input the following information.
Queue index <0~3>: 0
Weight value (ENTER for default) <1>: 1
--------------------------------------------------------------------------------
```

For example, the default values are shown below:

[setup qos qweight 0 1]

[setup qos qweight 1 2]

[setup qos qweight 2 4]

[setup qos qweight 3 8]

QoS Mode	0	1	2	3
Weight Value				

Queue Egress Rate

Queues 0-3 can set up the egress rate for WFQ configuration.

```
q0GrssRt      Modify queue 0 egress rate
q1GrssRt      Modify queue 1 egress rate
q2GrssRt      Modify queue 2 egress rate
q3GrssRt      Modify queue 3 egress rate
```

The egress rate *N* value can be set from 0 to 22. The *N* value 0 means no limits.

The egress data rate is a multiple of 1024kbps.

For example, the egress data rate = *N* value (1 to 22) x 1024 Kbps.

Table 23: Egress Rate (*N* Value)

Port	Egress Queue			
	0	1	2	3
LAN 1				
LAN 2				
LAN 3				
LAN 4				
DSL				

Port-Based Priority QoS

```
--------------------------------------------------------------------------------
Command: setup qos portPri <1~6> <0~3>
Message: Please input the following information.
Port index <1~6>: 1
Queue index (ENTER for default) <3>: 3
--------------------------------------------------------------------------------
```

Set up the queue value (0, 1, 2 or 3) on each port.

Table 24: Port-Based Priority QoS Options

Port	1 (LAN1)	2 (LAN2)	3 (LAN3)	4 (LAN4)	5 (Line)	6 (Sniffing)
Queue Index						

VLAN Tag Priority QoS

```
--------------------------------------------------------------------------------
Command: setup qos vlanTagPri <0~7> <0~3>
Message: Please input the following information.
VLAN TAG index <0~7>: 0
Queue index (ENTER for default) <1>: 1
--------------------------------------------------------------------------------
```

Set up the queue index (0, 1, 2 or 3) on Priority VLAN Tag.

VLAN Tag Priority uses the tag field information which has been inserted into an Ethernet frame. If a port has an 802.1Q-compliant device attached (such as this Ethernet Extender), these tagged frames can carry VLAN membership information.

Priority defines the user priority level for different classes of traffic. There are 8 possible priority levels, with 0 being the lowest priority level and 7 being the highest level. Each Priority level can be set queue from 0 to 3.

Table 25: VLAN Tag Priority Levels

Priority Level	Traffic Type
0 (default)	Best Effort
1	Background
2	Spare
3	Excellent Effort
4	Controlled Load
5	Video, less than 100 milliseconds latency and jitter
6	Voice, less than 10 milliseconds latency and jitter
7	Network Control

For example, you can set the LB52xA-KIT to use Weighted Round-Robin (WRR) queuing (Type 1) that specifies a relative weight of each queue. WRR uses a predefined relative weight for each queue that determines the percentage of time to service for each queue before moving on to the next queue.

Table 26: VLAN Tag Priority QoS Options

VLAN Tag Index	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Queue Index								

IP DSCP Priority QoS

Differentiated Services (DiffServ) is a class of service (CoS) model that enhances best-effort Internet services by differentiating traffic by users, service requirements and other criteria. Packets are specifically marked, allowing network nodes to provide different levels of service, as appropriate for video playback, voice calls or other delay-sensitive applications, via priority queuing or bandwidth allocation.

The DSCP value used to identify 64 levels (26=64) of service determines the forwarding behavior that each packet gets across the DiffServ network. Based on the marking rule different kinds of traffic can be marked for different priorities of forwarding.

Resources can then be allocated according to the DSCP values and the configured policies.

Set up queue index (0, 1, 2 or 3) on each DSCP:

```
-------------------------------------------------------------------------------
Command: setup qos ipDscpPri <0~63> <0~3>
Message: Please input the following information.
IP DSCP index <0~63>: 0
Queue index (ENTER for default) <0>:
-------------------------------------------------------------------------------
```

Table 27: IP DSCP Priority QoS Options

DSCP	Queue Index	DSCP	Queue Index	DSCP	Queue Index	DSCP	Queue Index
0		16		32		48	
1		17		33		49	
2		18		34		50	
3		19		35		51	
4		20		36		52	
5		21		37		53	
6		22		38		54	
7		23		39		55	
8		24		40		56	
9		25		41		57	
10		26		42		58	
11		27		43		59	
12		28		44		60	
13		29		45		61	
14		30		46		62	
15		31		47		63	

List

Use the list command to view the QoS settings.

5.8.5 Rate

The **rate** command menu lists commands for setting the port rate. Move the cursor "**>>**" to **rate** in the **setup** menu and press Enter. The following menu displays:

```
>> port          Modify port rate
   list          Show Rate Control configuration
```

Select the port you want to modify, then set up the data rate.

```
--------------------------------------------------------------------------------
Command: setup rate port <1~5> <0~22>
Message: Please input the following information.
Port index <1~5>: 1
rate (ENTER for default) <0>:
--------------------------------------------------------------------------------
```

The data rate is a multiple of 1024kbps with the setup rate. Table 28 shows the options available to set up the data rate:

Table 28: Rate Options

Port 1	**LAN1**	☐ **No Limit** ☐ **128K** ☐ **256K** ☐ **512K** ☐ **1M**
Port 2	**LAN2**	☐ **No Limit** ☐ **128K** ☐ **256K** ☐ **512K** ☐ **1M**
Port 3	**LAN3**	☐ **No Limit** ☐ **128K** ☐ **256K** ☐ **512K** ☐ **1M**
Port 4	**LAN4**	☐ **No Limit** ☐ **128K** ☐ **256K** ☐ **512K** ☐ **1M**
Port 5	**Line**	☐ **No Limit** ☐ **128K** ☐ **256K** ☐ **512K** ☐ **1M**
Port 6	**Sniffing**	☐ **No Limit** ☐ **128K** ☐ **256K** ☐ **512K** ☐ **1M**

5.8.6 Management

The **Management** command menu lists commands for configuring the IP address and subnet mask for the Management port. Move the cursor "**>>**" to **Management** in the **setup** menu and press Enter. The following menu displays:

```
>> address       Management IP address and subnet mask

          ------------------------------------------------------------------------
          Command: setup Management <1~1> <more...>
           Message: Please input the following information.
          Interface number <1~1>:
          ------------------------------------------------------------------------
```

The LB52xA-KIT only has one Management interface. The default interface number is **1**. The default IP address and subnet mask are **196.168.1.1** and **255.255.255.0**.

```
          ------------------------------------------------------------------------
          Command: setup Management 1 address <ip> <netmask>
           Message: Please input the following information.
          IP address (ENTER for default) <192.168.1.1>:
           Subnet mask (ENTER for default) <255.255.255.0>:
          ------------------------------------------------------------------------
```

5.8.7 DHCP

Dynamic Host Configuration Protocol (DHCP) is a communication protocol that allows network administrators to manage and automate the assignment of Internet Protocol (IP) addresses in an organization's network. Each machine that can connect

to the Internet needs a unique IP address. When an organization sets up the users with a connection to the Internet, an IP address must be assigned to each machine.

Without DHCP, the IP address must be entered manually at each computer. If computers move to another location in another part of the network, a new IP address must be entered. DHCP lets a network administrator supervise and distribute IP addresses from a central point and automatically sends a new IP address when a computer is plugged into a different place in the network.

DHCP Server

The **dhcp** command menu lists commands for configuring DHCP settings. Move the cursor "**>>**" to **dhcp** in the **setup** menu and press Enter. The following menu displays:

```
>> generic       DHCP server generic parameters
   fixed         DHCP server fixed host IP list
   list          Show DHCP configuration
```

The **generic** command menu lists commands for configuring general DHCP settings. Move the cursor "**>>**" to **generic** in the **dhcp** menu and press Enter. The following menu displays:

```
>> active        Trigger DHCP server function
   gateway       Default gateway for DHCP client
   netmask       Subnet mask for DHCP client
   ip_range      Dynamic assigned IP address range
   lease_time    Configure max lease time
   name_server1  Domain name server1
   name_server2  Domain name server2
   name_server3  Domain name server3
```

Table 29: DHCP Command Descriptions

Command	Description
Active	**Trigger DHCP server function**
Gateway	**Configure default gateway for DHCP client**
Netmask	**Configure subnet mask for DHCP client**
IP Range	**Configure dynamic assigned IP address range**

Table 29: DHCP Command Descriptions

Command	Description
Lease Time	**Set up dynamic IP maximum lease time**
Name Server 1	**Set up the IP address of name server #1**
Name Server 2	**Set up the IP address of name server #2**
Name Server 3	**Set up the IP address of name server #3**

DHCP Fixed Host

The **dhcp** command menu lists commands for configuring DHCP settings. Move the cursor "**>>**" to **dhcp** in the **setup** menu and press Enter. The following menu displays:

```
   generic      DHCP server generic parameters
>> fixed        DHCP server fixed host IP list
   relay        DHCP relay parameter
   list         Show DHCP configuration
```

The **fixed** command menu lists commands for configuring a Fixed Host IP Address list. Move the cursor "**>>**" to **fixed** in the **dhcp** menu and press Enter. The following menu displays:

```
>> add          Add a fixed host entry
   delete       Delete a fixed host entry
```

When using the fixed host entry function, you must enter the MAC address and IP address at the same time. You can configure up to 10 maximum fixed host IP addresses.

Use the **list** command to view the DHCP configuration.

5.8.8 DNS Proxy

The **dns_proxy** command allows you to set up three DNS servers for the LB52xA-KIT. Move the cursor "**>>**" to **dns_proxy** in the **setup** menu and press Enter.

```
---------------------------------------------------------------------
Command: setup dns_proxy <IP> [IP] [IP]
Message: Please input the following information.
```

```
DNS server 1 (ENTER for default) <168.95.1.1>: 10.0.10.1
DNS server 2: 10.10.10.1
DNS server 3:
------------------------------------------------------------------------
```

5.8.9 Host Name

A **Host Name** is a unique name that attaches a host to a network. The hostname is used to identify a particular host in various forms of electronic communication. Some ISP providers require the Host Name as identification. You may check with your ISP to see if your Internet service has been configured with a hostname. In most cases, you can ignore this field.

Move the cursor "**>>**" to **hostname** in the **setup** menu and press Enter. The hostname cannot use spaces and cannot have more than 15 characters.

```
------------------------------------------------------------------------
Command: setup hostname <name>
Message: Please input the following information.

Local hostname (ENTER for default) <SOHO>: test
------------------------------------------------------------------------
```

5.8.10 Factory Default

If you want to restore factory default settings for the LB52xA-KIT, move the cursor "**>>**" to **default** in the **setup** menu and press Enter.

```
------------------------------------------------------------------------
Command: setup default <name>
Message: Please input the following information.

Are you sure? (Y/N): y
------------------------------------------------------------------------
```

5.9 STATUS COMMAND MENU

The **status** command menu lists commands for viewing the system status of interfaces on the LB52xA-KIT. Move the cursor " **>>**" to **status** in the main menu and press Enter.

When you enter the **status** command, the following menu displays:

```
>> LINE       Show LINE status
   interface  Show interface statistics status
```

Table 30: Status Command Menu

Command	Description
LINE	**The LINE status includes mode, line rate, SNR margin, attenuation, and CRC error count of the local side modem, and SNR margin, attenuation and CRC error count of remote side modem. The modem can access remote side information via EOC (embedded operation channel).**
interface	**Use the interface command to view the statistic status of the Management interface.**

5.9.1 LINE Status

The **LINE** command shows the status of the Line port. Move the cursor "**>>**" to **LINE** in the **status** menu and press Enter. The LINE status includes mode, line rate, SNR margin, attenuation, and CRC error count of the local side Ethernet Extender, and SNR margin, attenuation and CRC error count of the remote side Ethernet Extender.

```
                                LINE Bridge
-------------------------------------------------------------------
Monitoring Window...

<LINE Status>
Channel             :     1    /     2    /     3    /     4
LINE Mode           : CO Side  / CO Side  / CO Side  / CO Side
Line Rate(n*64)     :    0kbps /    0kbps /    0kbps /    0kbps
Current SNR Margin  :    0dB   /    0dB   /    0dB   /    0dB
Attenuation         :    0dB   /    0dB   /    0dB   /    0dB
CRC Error Count     :    0     /    0     /    0     /    0

<LINE Remote Side Status>
Channel             :     1    /     2    /     3    /     4
Current SNR Margin  :    0dB   /    0dB   /    0dB   /    0dB
Attenuation         :    0dB   /    0dB   /    0dB   /    0dB
CRC Error Count     :    0     /    0     /    0     /    0

Refresh counter:10. Press 'Ctrl+C' to quit...
```

Figure 65. LINE Status

5.9.2 Interface Status

To view the status of the Management interface, move the cursor "**>>**" to **interface** in the **status** menu and press Enter.

```
                                    LINE Bridge
--------------------------------------------------------------------------------
Monitoring Window...

<Interface Statistics>
Port    InOctets    InPackets   OutOctets   OutPackets InDiscards OutDiscards
---- ------------ ---------- ------------ ---------- ---------- ------------
MGMT       8489898      92390       688419       7410          0           0
 LAN             0          0         6464        101          0           0

Refresh counter:7. Press 'Ctrl+C' to quit...
■
```

Figure 66. Interface Status

Table 31: Interface Statistics

Parameter	Description
InOctets	**The number of received bytes on this port**
InPackets	**The number of received packets on this port**
OutOctets	**The number of transmitted bytes on this port**
OutPackets	**The number of transmitted packets on this port**
InDiscards	**The discarded number of received packets on this port**
OutDiscards	**The discarded number of transmitted packets on this port**

5.10 SHOW COMMAND MENU

The **show** command menu lists commands for viewing system and configuration information for the LB52xA-KIT. Move the cursor "**>>**" to **show** in the main menu and press Enter.

When you enter the **show** command, the following menu displays:

```
>> system     Show general information
   script     Show all configuration in command script
```

Table 32: Show Command Menu

Command	Description
system	**Displays general system information**
script	**Displays configuration information in command script**

Move the cursor " **>>**" to **system** in the **show** menu and press Enter.

```
                                LINE Bridge
--------------------------------------------------------------------------------
Status Window...

General system information
 MCSV                :1608-0000-10213ADE
 Software Version    :1608-0000-10613C79
 Chipset             :PEF 22628
 Firmware Version    :1.1-1.5.7__004
 Hostname            :SOHO
 Serial No           :BKM5D2TV0031
 System Up Time      :0DAY/0HR/10MIN

Press 'Enter' to Return Menu Window..._
```

Figure 67. System Information

```
                            SHDSL.bis EFM Bridge
--------------------------------------------------------------------------------
Status Window...

Showing System Configuration.....

setup shdsl.bis mode STU-R
setup shdsl.bis link 8-Wire
setup shdsl.bis annex Annex_BG
setup shdsl.bis tcpam Auto(16/32)
setup shdsl.bis maxMainRate 89
setup shdsl.bis snrMargin 5
setup shdsl.bis lineProbe Disable
setup lan 1 link_type Disable
setup lan 1 address 192.168.2.1 255.255.255.0
setup vlan mode Disable
setup vlan modify 1 1 111111
setup vlan modify 2 0 000000
setup vlan modify 3 0 000000
setup vlan modify 4 0 000000
setup vlan modify 5 0 000000
--- MORE ---
--------------------------------------------------------------------------------
 <I/K> Move up/down, <L/J> Select/Unselect, <U/O> Move top/bottom, <^Q> Help
```

Figure 68. Show Script

5.11 WRITE COMMAND

The **write** command saves all new configuration changes to Flash on the LB52xA-KIT. You *must* use the write command and reboot the Ethernet Extender for new configuration changes to take effect. Move the cursor "**>>**" to **write** in the main menu and press Enter.

```
--------------------------------------------------------------------------
Command: write <CR>
Message: Please input the following information.
```

```
Are you sure? (y/n): y
------------------------------------------------------------------------
```

5.12 REBOOT COMMAND

The **reboot** command restarts the LB52xA-KIT. Move the cursor "**>>**" to **reboot** in the main menu and press Enter.

```
------------------------------------------------------------------------
Command: reboot <CR>
Message: Please input the following information.

Do you want to reboot? (y/n): y
------------------------------------------------------------------------
```

Type "y" to begin the reboot process.

5.13 PING COMMAND

The **ping** command checks the connection of the LB52xA-KIT to the network. Move the cursor "**>>**" to **ping** in the main menu and press Enter.

The **ping** command sends an echo request packet to an address, and then waits for reply. The ping output can help you evaluate path-to-host reliability, delays over the path, and whether the host can be reached or is functioning correctly.

```
------------------------------------------------------------------------
Command: ping <ip> [1~65534|-t] [1~1999]
Message: Please input the following information.

IP address <IP> : 10.0.0.1
Number of ping request packets to send (TAB select): -t
Data size [1~1999]: 32
------------------------------------------------------------------------
```

There are 3 parameters for the **ping** command:

- **IP address:** Enter the IP address that you want to ping.
- **Number of ping request packed to send:** Use the TAB key to select the following options.

- ***Default:*** Sends 4 packets only
- ***1~65534:*** Sets the number of ping request packets from 1 to 65534
- ***-t :*** Results run continuously until you press the Ctrl key to stop the process

• **Data Size:** Select from 1 to 1999

5.14 ADMINISTRATION COMMAND MENU

The **admin** command menu lists commands for modifying user profiles, Telnet access, Simple Network Management Protocol (SNMP), and supervisor information (username and password). Move the cursor "**>>**" to **admin** in the main menu and press Enter.

When you enter the **admin** command, the following menu displays:

```
>> user       Manage user profile
   security   Setup system security
   snmp       Configure SNMP parameter
   passwd     Change supervisor password
   id         Change supervisor ID
```

5.14.1 User Profile

The **user** command menu lists commands to clear, modify, and list user profiles. You can create up to 5 user profiles to access the LB52xA-KIT vis the console port. However, users with supervisor privleges have access to changing the configuration of the LB52xA-KIT.

Move the cursor "**>>**" to **user** in the **admin** menu and press Enter. The following menu displays:

```
>> clear        Clear the user profile
   modify       Modify the user profile
   list         List the user profile
```

Use the **clear** command to delete a user. Use the **list** command to show information for a user profile. Use the **modify** command to edit user information or add a new user to a user profile.

Modify/Add User

To modify a user profile or add a new user, move the cursor "**>>**" to **modify** the **user** menu and press Enter. Select the profile number for the user profile you want to modify.

```
-------------------------------------------------------------------------
Command: admin user modify <1~5> <more...>
Message: Please input the following information.

Legal access user profile number <1~5> : 2
-------------------------------------------------------------------------
```

The **modify** menu displays:

```
>> attrib       UI mode
   profile      User name and password
```

Move the cursor "**>>**" to **attrib** in the **modify** menu and press Enter.

```
-------------------------------------------------------------------------------
 Command: admin user modify 2 attrib <Command|Menu>
 Message: Please input the following information.

 User interface (TAB Select) <Menu>:
-------------------------------------------------------------------------------
```

There are two UI modes for setting up the LB52xA-KIT, command and menu mode. The **menu mode** uses a menu-driven interface. The **command mode** uses line commands. (Command mode is not covered in this manual). Move the cursor "**>>**" to **profile** in the **modify** menu and press Enter.

```
-------------------------------------------------------------------------------
 Command: admin user modify 2 profile <name> <pass_conf>
 Message: Please input the following information.

 Legal user name (ENTER for default) <test>:
 Input the old Access password: ****
 Input the new Access password: ****
Re-type Access password: *****
 -------------------------------------------------------------------------------
```

Enter the username and set up the new access password. You must enter the new access password twice for confirmation.

Use the **list** command to view information for each user profile, including username and UI mode.

5.14.2 Security

The **security** command menu lists commands to configure sixteen legal IP addresses for Telnet access and the Telnet port number. Move the cursor "**>>**" to **security** in the **admin** menu and press Enter. The following menu displays:

```
>> port          Configure telnet TCP port
   ip_pool       Legal IP address pool
   list          Show security profile
```

Telnet TCP Port

To set up the Telnet TCP port, move the cursor "**>>**" to **port** in the **security** menu and press Enter. You can select a port number from 1 to 65534. The default number is 23.

```
-------------------------------------------------------------------------------
 Command: admin security port <1~65534>
 Message: Please input the following information.

 Telnet Listening TCP Port (ENTER for default) <23>:
 -------------------------------------------------------------------------------
```

Legal IP Address Pool

The default legal address is 0.0.0.0. (on entry number 1). This means that there are no IP address restrictions for accessing the LB52xA-KIT via Telnet. To change the legal IP address pool, move the cursor "**>>**" to **ip_pool** in the **security** menu and press Enter. Select **modify** to set up the IP address pool.

```
-------------------------------------------------------------------------------
 Command: admin security ip_pool modify <1~16> <ip>
 Message: Please input the following information.

 Client address pool entry number <1~16>: 1
 Client IP address (ENTER for default) <0.0.0.0>:
 -------------------------------------------------------------------------------
```

You can configure up to sixteen entries for legal address pools. Use the **clear** command to remove a legal client IP address from any pool entry number. Use the **list** command to view information for all of the security profiles, including the Telnet TCP port and the legal IP addresses.

5.14.3 SNMP

Simple Network Management Protocol (SNMP) provides the exchange of messages between a network management client and a network management agent for remote management of network nodes. These messages contain requests to get and set variables that exist in network nodes in order to obtain statistics, set configuration parameters and monitor network events. SNMP communications can occur over the LAN or WAN connection.

The LB52xA-KIT can generate SNMP traps to indicate alarm conditions, and it relies on SNMP community strings to implement SNMP security. This LB52xA-KIT support both MIB I and MIB II.

The **snmp** command menu lists commands for configuring SNMP communities and traps. Move the cursor "**>>**" to **snmp** in the **admin** menu and press Enter. The following menu displays:

```
>> community    Configure community parameter
   trap         Configure trap host parameter
```

Community

To set up SNMP communities, move the cursor "**>>**" to **community** in the **snmp** menu and press Enter. You can configure five community entries.

```
-------------------------------------------------------------------------
Command: admin snmp community <1~5> <more...>
Message: Please input the following information.
Community entry number <1~5> : 2
-------------------------------------------------------------------------
```

The following menu displays:

```
>> edit         Edit community entry
   list         Show community configuration
```

Select **edit** and press Enter.

```
--------------------------------------------------------------------------
Command: ... 2 edit <Disable|Enable> <string> <Read_Only|Read_Write|Denied>
Message: Please input the following information.

Validate (TAB Select) <Enable>: Enable
Community (ENTER for default) <private>:
Access right (TAB Select) <Denied>:
--------------------------------------------------------------------------
```

You can set up the following options:

- **Validate:** Set to ***Enable*** or ***Disable***.
- **Community:** Enter the desired password for community access.
- **Access right:** Set to ***Read only***, ***Read Write*** or ***Denied***.

Read_Only	**Users have read-only access to the community**
Read_Write	**Users have read and write access to the community**
Denied	**There is no access to the community**

Use the **list** command to view all SNMP community pool entries. You can also configure five SNMP trap entries.

Trap host

To set up SNMP traps, move the cursor "**>>**" to **trap** in the **snmp** menu and press Enter. You can configure five trap entries.

```
--------------------------------------------------------------------
Command: admin snmp trap <1~5> <more...>
Message: Please input the following information.

Trap host entry number <1~5> : 2
--------------------------------------------------------------------
```

The following menu displays:

```
>> edit          Edit trap host parameter
   list          Show trap configuration
```

Select **edit** and press Enter.

```
--------------------------------------------------------------------------------
Command: admin snmp trap 1 edit <Disable|1|2> <ip> <string>
Message: Please input the following information.

Version (TAB Select) <Disable>:
Trap host IP address (ENTER for default) <192.168.0.254>:
Community (ENTER for default) <private>:

--------------------------------------------------------------------------------
```

You can set up the following options:

- **Version:** Set to ***Disable***, ***Version 1*** or ***Version 2***.
- **Trap host IP address:** Enter the dtrap host IP address.
- **Community:** Enter the community password.

Use the **list** command to view all SNMP trap host entries.

5.14.4 Supervisor Password and ID

The supervisor ID and password is the last option in the **security** command menu, but it is the most important menu item. Users who access the LB52xA-KIT via a web browser or console/Telnet must use the supervisor ID and password to configure the LB52xA-KIT. You should change the supervisor ID and password after initial configuration.

	ID	Password
Web Browser	•	•
Telnet/Console		•

Supervisor Password

To change the supervisor password, move the cursor "**>>**" to **password** in the **security** menu and press Enter.
The default password is **root**.

```
--------------------------------------------------------------------------------
Command: admin passwd <pass_conf>
Message: Please input the following information.
```

```
Input old Supervisor password: ****
Input new Supervisor password: ********
Re-type Supervisor password: ********
------------------------------------------------------------------------
```

Supervisor ID

To change the supervisor ID, move the cursor "**>>**" to **id** in the **security** menu and press Enter.
The default ID is **root**.

```
------------------------------------------------------------------------------
 Command: admin id <name>
 Message: Please input the following information.

 Legal user name (ENTER for default) <root>:

 ------------------------------------------------------------------------------
```

Figure 48. on page 59 shows a flowchart of user access functions using the web browser or console/Telnet.

5.15 UTILITY COMMAND MENU

LB52xA-KIT has three utility tools embedded in the firmware: **upgrade**, **backup** and **restore**. You can update the new firmware via TFTP upgrade tools, backup the configuration via the TFTP backup tool and restore the configuration via the TFTP restore tool. To upgrade the firmware, you must have the new firmware file named ***.bin** that will be supported by supplier. Also, you must have your own TFTP server. For backup and restore operations, you must also have your own TFTP server to backup and restore the configuration files.

Move the cursor "**>>**" to **utility** in the main menu and press Enter. The following menu displays:

```
>> upgrade    Upgrade main software
   backup     Backup system configuration
   restore    Restore system configuration
```

5.15.1 Upgrade main software

To upgrade the LB52xA-KIT firmware, move the cursor "**>>**" to **upgrade** in the **utility** menu and press Enter. Type the TFTP server IP address and name of the upgraded firmware file.

```
------------------------------------------------------------------------------
 Command: utility upgrade <ip> <file>
 Message: Please input the following information.

 TFTP server IP address (ENTER for default) <192.168.0.2>:
 Upgrade filename (ENTER for default) <default.bin>:
 ------------------------------------------------------------------------------
```

5.15.2 Backup system configuration

To backup the current system configuration, move the cursor "**>>**" to **backup** in the **utility** menu and press Enter. Type the TFTP server IP address and name for the backup file.

```
------------------------------------------------------------------------------
 Command: utility backup <ip> <file>
 Message: Please input the following information.

 TFTP server IP address (ENTER for default) <192.168.0.2>:
 Upgrade filename (ENTER for default) <default.bin>:
 ------------------------------------------------------------------------------
```

5.15.3 Restore system configuration

To restore a saved configuration file, move the cursor "**>>**" to **restore** in the **utility** menu and press Enter. Type the TFTP server IP address and name of the system configuration file you want to restore to the LB52xA-KIT.

```
------------------------------------------------------------------------------
 Command: utility restore <ip> <file>
 Message: Please input the following information.

 TFTP server IP address (ENTER for default) <192.168.0.2>:
Upgrade filename (ENTER for default) <default.bin>:
 ------------------------------------------------------------------------------
```

5.16 EXIT COMMAND

To log out of the system without saving your changes, move the cursor "**>>**" to **exit** in the main menu and press Enter.

```
   enable    Modify command privilege
   setup     Configure system
   status    Show running system status
   show      View system configuration
   write     Update flash configuration
   reboot    Reset and boot system
   ping      Packet internet groper command
   admin     Setup management features
   utility   TFTP upgrade utility
>> exit      Quit system
```

```
---------------------------------------------------------------------------
 Command: exit <CR>
 Message: Please input the following information.

 Do you want to disconnect? (y/n): y
---------------------------------------------------------------------------
```

Press "**y**" to exit the system. A confirmation screen displays:

```
-----------------------------------------------------------------
Connection closed...
Press SPACE key to enter console mode configuration!

-----------------------------------------------------------------
```

A. SPECIFICATIONS

A.1 LINE CONNECTOR

Shielded RJ-45

A.2 LINE MODULATION

TC-PAM 32; TC-PAM 16; TC-PAM 128

A.3 ETHERNET CONNECTOR

4 x 8-position shielded RJ-45

Auto-sensing 10/100Base-TX with half or full-duplex operation

A.4 LAN PROTOCOLS

802.1d Transparent Bridging; 2K MAC address learning bridge

A.5 VLAN SUPPORT

IEEE 802.1q VLAN Tagging

Port Based VLAN, up to 4K VLANs

VLAN Stacking (Q-in-Q)

A.6 QOS SUPPORT

Rate limiting rule-based/port-based

Traffic classification based on port/802.1p/DSCP (Differentiated Services Code Point)

WRR (Weighted Round Robin)/SPQ (Strict Priority Queing) scheduling algorithm

A.7 MANAGEMENT CONNECTOR

WEB: Shielded RJ-45

Console: Shielded RJ-45

A.8 MANAGEMENT INTERFACE

Web based GUI

CLI for local and console access; password protected;

SNMP v1/v2 (RFC 1157/1901/1905) agent and MIB (RFC 1213/1493)

EFM OAM (IEEE 802.3af)

Software upgradeable via web-browser/TFTP

A.9 FRONT PANEL INDICATORS

Power, Alarm, Diagnostic, WAN Link (x4), Ethernet Link (x4), Ethernet 100M (x4)

A.10 POWER SUPPLY

AC: Universal Input (UI)—90–240 VAC (50~60Hz)

A.11 OPERATING TEMPERATURE

32 to 122° F (0 to 50°C)

A.12 STORAGE TEMPERATURE

-40 to +185°F (0 to +50°C)

A.13 DIMENSIONS

7.67L x 1.89W x 6.61D in. (195L x 48H x 168D mm)

A.14 WEIGHT

2.86 lbs (1300 g) without power supply

B. Port Pin-outs

This section provides pin-out information for the ports of the LB52xA-KIT.

B.1 CONSOLE PORT

Configuration settings: 9600 bps, 8 bits, no parity, 1 stop bit, no flow control.

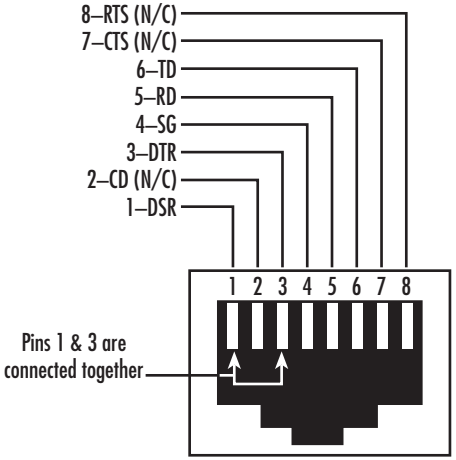

Figure 69. EIA-561 (RJ-45 8-pin) port

NOTE: N/C means no internal electrical connection.

B.2 ETHERNET

Table 33: RJ45 socket 10/100Base-T

Pin	Signal
1	TX+
2	TX-
3	RX+
6	RX-

B.3 LINE (BLACK BOX)

Table 34: RJ45 socket Black Box

Pin	Signal			
4	TRD0+	522A		
5	TRD0-			
3	TRD1+		524A	
6	TRD1-			
7	TRD2+			
8	TRD2-			
1	TRD3+			528A
2	TRD3-			

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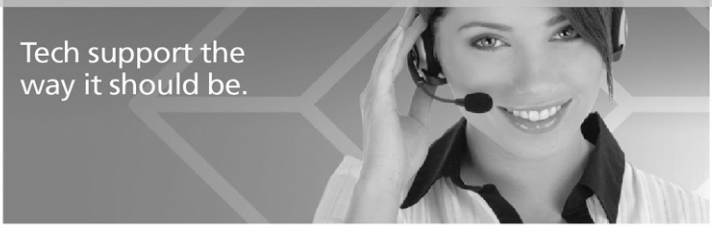

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